1922.

QUEENSLAND.

TWENTY-SECOND ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

(AS REQUIRED BY "*THE SUGAR EXPERIMENT STATIONS ACT OF* 1900").

IMPERIAL BUREAU OF MYCOLOGY 31 OCT 1923

Presented to Parliament by Command.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Twenty-second Annual Report of the Bureau of Sugar Experiment Stations up to the 31st October, 1922.

H. T. EASTERBY,
Director.

Brisbane, 30th December, 1922.

DIRECTOR'S REPORT.

The Annual Report of the Bureau for 1922 comprises :—

1. Introduction.
2. Approximate Estimate of the 1922 Cane Crop, and Comparative Progress of the Industry during the past Twenty-three Years.
3. General Work, with Brief Survey of the various Sugar Districts.
4. Work of the Northern Sugar Experiment Station at South Johnstone.
5. Work of the Central Sugar Experiment Station at Mackay.
6. Work of the Southern Sugar Experiment Station at Bundaberg.
7. Varieties of Cane grown by the Sugar Experiment Stations since 1893.
8. Work of the Laboratories.
9. Work of the Division of Entomology.
10. Sugar Canes, Seedlings, Varieties of Cane at Atherton State Farm, Introduction of New Canes, &c.
11. Lime, Green Manures, and Fertilisers.
12. Economics of the Industry.
13. General.

1.—INTRODUCTION.

Due to the appointment of the Director upon a Royal Commission to enquire into locations for new sugar-mills, the Annual Report is somewhat later than usual in making its appearance.

The present season is the last one covered by the Agreement between the Commonwealth and State Governments made in 1920 for three years, which provided for the payment of £30 6s. 8d. per ton for raw sugar.

Under this agreement the sugar industry has progressed very considerably. At the commencement of the three-year period there was a feeling of security in knowing that the industry was not to be interfered with for that time. As pointed out in last year's report, this led to the bringing of new areas under cane, the opening up of new districts, and the increasing of the capacity and efficiency of nearly every sugar-mill. The yield of sugar in 1921, with a favourable season, overtook the consumption. All this proves strongly what the industry can accomplish if it is given what it most needs—*i.e.*, STABILITY.

The renewal of the Agreement was, therefore, of the highest importance to the welfare of the industry. The Queensland Government and all interested in the Queensland sugar industry therefore made every effort to accomplish this. Propaganda work was launched in the Southern States with a view to combating the hostility which reigns, principally in Victoria, as a result of newspaper misunderstanding. Unfortunately, the large amount of work put in, while doing an immense amount of good in several directions, was unable to accomplish its prime object—the renewal of the agreement—either as it stood or in a modified form. Failing this, a protective duty of £11 6s. 8d. was pressed for, but this too was defeated, and a duty of £9 6s. 8d. was fixed. This was disappointing, but it is strongly hoped that wiser counsels will prevail in the new

Federal Parliament, and an adequate provision be made for carrying on the sugar industry under such conditions of stability as will encourage its expansion and provide for its great object—that of settling our Northern Coast.

The security of the southern people is so indissolubly bound up with the safety of Northern Australia that it is difficult to understand any clamour which has for its object the prevention of the settlement of our Northern littoral. Already, by means of the sugar industry, much has been accomplished in this direction, but there are yet tracts of unoccupied jungle in the North awaiting the advent of sugar-cane cultivation to settle and open them up in the same manner as the rich tropical lands of Babinda and South Johnstone have been occupied.

The last three years have been excellent ones for putting the precepts and advice of the Sugar Experiment Stations into practice, and most encouraging results have to be recorded. Growers have felt able to spend more money upon their farms in the purchase of implements and fertilisers, while the feeling of security has given them more heart to improve their areas by much improved cultivation.

The year under review opened up splendidly with every prospect for a record crop. The rains towards the end of 1921 were most satisfactory. During the wet season period, however, viz.—January to April, 1922, the usual volume of rain did not fall, while the Southern rainfall was particularly low. Good rains, however, were experienced in June and July, which considerably improved the crop which was then backward. The remainder of the year, unfortunately, proved very dry, more particularly above Rockhampton. The sugar yield, however, should be a good one. It is anticipated that it will even be somewhat better than its immediate predecessor, due to the higher density in the cane during the crushing period. If so, it will be the largest crop harvested since the record year of 1917.

2.—APPROXIMATE ESTIMATE OF THE 1922 CANE CROP.

The cane crop for 1922 is approximately expected to be in the vicinity of 2,194,712 tons. This will not be so heavy a cane yield per acre as 1921, but the higher sugar content in the cane is expected to produce a better yield of sugar. There was estimated by the Government Statistician to be cane from 27,000 additional acres crushed this year.

The following table shows the rough preliminary estimate formed in May last, together with the estimate of the mills made in October of the present year:—

Mill.	Rough Preliminary Estimate Made in May.	Approximate Estimate Furnished by the Mills in October.	Remarks.
Mossman	70,000	62,410	Reduction caused by dry weather
Hambledon	120,000	118,000	,, ,, ,,
Babinda	120,000	110,000	,, ,, ,,
Mulgrave	120,000	92,000	,, ,, ,,
Goondi	120,000	90,000	,, ,, ,,
South Johnstone	140,000	110,000	,, ,, ,,
Mourilyan	90,000	70,000	,, ,, ,,
Victoria	116,000	114,000	,, ,, ,,
Macknade	107,000	101,000	,, ,, ,,
Pioneer	114,000	98,000	,, ,, ,,
Kalamia	90,000	74,500	,, ,, ,,
Inkerman	130,000	126,000	,, ,, ,,
Invicta	40,000	37,474	,, ,, ,,
Proserpine	52,000	34,160	,, ,, ,,
Cattle Creek	38,000	35,000	,, ,, ,,
Racecourse	40,000	41,442	,, ,, ,,
Plane Creek	55,000	56,000	
Farleigh	98,000	92,000	Reduction caused by dry weather.
Pleystowe	50,000	40,000	,, ,, ,,
Marian	50,000	45,000	,, ,, ,,
Palms	36,000	28,600	,, ,, ,,
North Eton	36,000	30,700	,, ,, ,,
Qunaba	60,000	43,500	,, ,, ,,
Millaquin	80,000	71,500	,, ,, ,,
Fairymead	122,000	113,000	,, ,, ,,
Bingera	100,000	75,000	,, ,, ,,
Gin Gin	30,000	30,000	
Childers	130,000	99,000	Reduction caused by dry weather.
Doolbi	45,000	28,426	,, ,, ,,
North Isis	60,000	45,000	,, ,, ,,
Maryborough	18,000	10,000	,, ,, ,,
Mount Bauple	32,000	23,000	,, ,, ,,
Moreton	50,000	38,000	,, ,, ,,
Beenleigh District	13,000	12,000	,, ,, ,,
Total	2,572,000	2,194,712	

From the above table it will be seen that the cane crop came down considerably in tonnage since the month of May, due to the dry weather generally experienced.

Reports from nearly all the mills indicate that the commercial cane sugar in the cane this season has been exceptionally good. We may, perhaps, be entitled to assume that a ton of sugar will be made from something like 7·6 tons of cane. If this is realised, we will get a yield of about 288,000 tons of ~~cane~~ sugar, and this agrees closely with the estimate recently pub-

lished by the Government Statistician. The production in New South Wales should be about the same as last year, say, 17,000 tons of sugar. This, added to the Queensland yield, will give us 305,000 tons of sugar for Australia, which will again be a surplus over our consumption.

The prospects for next year are so far uncertain. Many of the Southern districts have had good rains, but the Northern sugar districts have been exceptionally dry.

COMPARATIVE PROGRESS OF THE INDUSTRY DURING THE PAST TWENTY-THREE YEARS.

Taking the yield of cane and sugar per acre and the tons of cane required to make 1 ton of sugar over twenty years, as shown in the following table, it may be noted that during the ten years from 1909 to 1918, there has been an average increase in the production of cane and sugar and a decrease in the amount of cane required to make 1 ton of sugar. The last figure is even better than it appears, as it is only during recent years that the yield of sugar has been calculated to the basis of 94 net titre:—

TABLE SHOWING YIELD OF CANE AND SUGAR PER ACRE AND TONS OF CANE REQUIRED TO MAKE ONE TON OF SUGAR DURING TWENTY-THREE YEARS.

Year.	Tons Cane per Acre.	Tons Sugar per Acre.	Tons Cane to 1 Ton Sugar
1899	14·81	1·55	9·54
1900	11·68	1·28	9·44
1901	15·10	1·55	9·76
1902	10·86	1·30	8·38
1903	13·65	1·52	8·97
1904	16·04	1·78	8·99
1905	14·73	1·59	9·27
1906	17·61	1·88	9·38
1907	17·64	2·00	8·84
1908	15·54	1·64	9·49
Ten Years' Average	14·76	1·60	9·20
1909	14·53	1·68	8·65
1910	19·45	2·23	8·73
1911	16·02	1·81	8·85
1912	12·72	1·45	8·79
1913	20·29	2·36	8·59
1914	17·80	2·09	8·51
1915	12·20	1·49	8·20
1916	20·81	2·33	8·93
1917	24·88	2·83	8·79
1918	15·01	1·70	8·82
Ten Years' Average	17·37	1·99	8·68
1919	14·83	1·91	7·76
1920	15·03	1·88	8·0
1921	18·60	2·30	8·11

It will be seen from the above figures, after allowing for better efficiency in the mills, that the work of the Sugar Experiment Stations—in constantly advocating and demonstrating better methods of cultivation, the use of green manures, lime, and fertilisers, together with the introduction and distribution of improved varieties of sugar-cane, has been highly successful, and will be still more so in the future; but allowance must always be made for droughty years.

In the following table is shown the improvement in area and amounts of cane harvested and sugar made during the past twenty-three years:—

TABLE SHOWING TOTAL ACRES CRUSHED AND TOTAL YIELDS OF CANE AND SUGAR PER ACRE FOR A PERIOD OF TWENTY-THREE YEARS.

Year.	Acres Crushed.	Yield.	
		Tons Cane.	Tons Sugar.
1899	79,435	1,176,466	123,289
1900	72,651	848,328	92,554
1901	78,160	1,180,091	120,858
1902	59,102	641,927	76,626
1903	60,375	823,875	91,828
1904	82,741	1,326,989	147,688
1905	96,093	1,415,745	152,722
1906	98,194	1,728,780	184,377
1907	94,384	1,665,028	188,307
1908	92,219	1,433,315	151,098
1909	80,095	1,163,569	134,584
1910	94,641	1,840,447	210,756
1911	95,766	1,534,451	173,296
1912	78,142	994,212	113,060
1913	102,803	2,085,588	242,837
1914	108,013	1,922,633	225,847
1915	94,459	1,152,516	140,496
1916	75,914	1,579,514	176,973
1917	108,707	2,704,211	307,714
1918	111,572	1,674,829	189,978
1919	84,877	1,258,760	162,136
1920	89,142	1,339,455	167,401
1921	122,956	2,287,416	283,198

3.—GENERAL WORK, WITH BRIEF SUMMARY OF SUGAR DISTRICTS.

The Bureau of Sugar Experiment Stations has now been in existence for twenty-two years. Originally commenced with one Sugar Experiment Station at Mackay and a Chemical Laboratory at Bundaberg, it now embraces Sugar Experiment Stations at South Johnstone and Bundaberg, in addition to Mackay, with Laboratories attached, and an Entomological Laboratory at Meringa, near Cairns. All this has added very materially to the work of the Director in the supervision and administration of experimental work.

In the canefields outside the Experiment Stations, the Director is assisted by Messrs. J. C. Murray (Southern) and Mr. E. H. Osborn (Northern) Field Assistants.

The Field Assistants constantly move from farm to farm, in order to assist cane farmers with instructions and advice. The Director gives frequent addresses to cane farmers on methods of cultivation, fertilising, and general treatment of cane lands. Growers requiring analyses of their soils and advice as to manuring are assisted by the Bureau, and over 1,000 soil analyses have so far been made for cane farmers.

Both Field Assistants have carried out their duties in a praiseworthy manner; and their visits and instructions to growers, particularly beginners in cane cultivation, are much appreciated. They are both carrying out good work in the interests of the industry, and it is satisfactory to know that this is acknowledged generally by growers.

In addition to instructing farmers, the Field Assistants are instructed to make observations on the following details at each farm visited; these notes being tabulated and sent to the head office every month:—Soils, crops, lime, green manure, fertilisers, drainage, irrigation, weather, ploughing, planting, cultivation, harvesting, labour, trashing, ratooning, pests and diseases, varieties of cane grown, climatic conditions, and arrowing of cane.

In pursuance of these instructions, the Field Officers have so far sent in reports upon 2,839 farms. Upon these 277 farmers have used lime, 579 have practised green manuring, and 597 have used fertilisers. The percentage of growers using lime, green manures, and fertilisers is much higher in the North than in the South.

There has been a great increase in the number of farmers using fertilisers during recent years.

Since the publication of the last Annual Report, the Director has visited practically every sugar district in Queensland. District visits also comprised inspection of canefields generally, estimating probable yields, noting of cane varieties in use, their health and vigour, and the introduction of new varieties. The latter are sent out in packages and carefully packed crates from the Sugar Experiment Stations of Bundaberg, Mackay, and Innisfail. A large number of farmers' meetings have also been held in various centres, at which addresses on cane cultivation and fertilising are given by the Director. These are followed by conversational discussions which are of great value in bringing out useful information. Good results invariably follow these meetings, and they enable the writer to come into touch with a large body of practical canegrowers.

It is found that a much larger interest is being taken in the sugar experimental work as its methods are brought before the farmer and discussed. There is not the slightest room for doubt that an upward tendency towards improvement has been made in cane cultivation during the past few years, which is directly attributable to the constant advice of the Sugar Bureau in the direction of better methods of cultivation.

In addition to the above, the clerical work of the Bureau has largely increased. Farmers are being constantly invited to submit their difficulties, and they are now doing this to a very much greater extent than hitherto, either by writing direct or putting their questions to the Field Assistants for transmission. A large number of samples of soil have been analysed during the year for cane farmers by the Agricultural Chemist and the Mackay and South Johnstone Laboratories. With each of these a letter of advice is also sent. Every possible effort is now being made to assist cane farmers, and it is gratifying to record that the efforts made in this direction are appreciated.

The supervision of the Sugar Experiment Stations at Bundaberg, Mackay, and South Johnstone, and the initiation of new experiments upon these stations, occupy a large part of the writer's time.

Highly successful Field Days, to which allusion will be made later, were held at Bundaberg and Mackay during the year.

Brief Survey of Districts Visited by Officers.

Mossman (One Mill).—This district is the outpost of the sugar industry in the North, and has experienced a good season. The crushing was somewhat better than last year, some 62,500 tons having been put through.

There is very little grub pest visible, and the cultivation and manuring have been good. Large quantities of fertilisers are purchased by the Mossman Mill for the use of farmers, and these are showing good results.

Up to the end of October 73·43 inches of rain had fallen. Considering the dry time all the other areas have had, this has been a very fair fall so far. A large amount of cultivation work has been put into the young plant cane, and it looked very green and healthy. Regarding the ratoons they looked remarkably well and appear better than most ratoons seen elsewhere.

The principal canes grown in the area are:—D. 1135, Black Innis, H.Q. 426, Badila, B. 147, and the Gorus (24, 24 A, and 24 B), with M.Q. 1 (Mowbray Seedling). In several cases this latter cane has given good results this season, both as regards tonnage per acre and also as to c.c.s. value.

Referring to new varieties, Messrs. Crees Bros. have gone to a lot of trouble to keep their nursery up to date. They now have a very good strike of Gingor, Obo Badila, H. 146, H. 109, E.K. 1, E.K. 28, H.Q. 458, Orambo, and Nanemo.

Cairns District (Three Mills).—In spite of dry weather good crops were harvested in this district, though, of course, not so heavy as anticipated early in the year.

A good deal of cane in the vicinity of Cairns, Hambledon, and Mulgrave was badly affected by grubs. It is very questionable whether it was a wise thing to abandon the collection of grubs and beetles, as was done some time ago. The matter is now under reconsideration, and it is probable that the collection, as a check measure, will again be proceeded with. Experiments with arsenic and carbon bi-sulphide have been carried out on Green Hills on limited areas with a good deal of success where large applications have been used. The principal feature in the Cairns district has been the enlargement of the two mills of Mulgrave and Hambledon, this being equal to another large mill in the district. This has enabled the fine Freshwater district to go ahead. A fine powerful crushing plant has been installed at Mulgrave to take the place of the old mills. The new plant consists of three new crushing mills, 72 x 35, with three 26 x 48 cylinder engines, all made by the Maryborough Foundry. In addition there are new juice heaters and a new set of quadruple effets bringing the heating surface up to 18,000 ft. The first and second mills have been set with 60 ft. centres, while between the second and third mill there are 45 ft., thus providing for plenty of maceration. There are also four high-pressure 120-lb. multitubular boilers, in addition to four 70-lb. boilers to be used for the evaporating plant. The capacity of the mill will be 45 tons per hour, the speed of the carrier 3·2 ft. per minute, the maximum roller speed being 16 ft. per minute. The maceration water will be passed through a juice heater so as to be very hot upon application. New centrifugals have also been installed. All the machinery, except the crushing plant, will be electrically driven. All this means that the Mulgrave is practically a new mill of at least 150,000 tons capacity, and it is little short of marvellous that the old machinery has been taken out and this fine new plant installed between the end of last crushing and the beginning of the present one. The new machinery was built by the Maryborough and Bundaberg foundries, and everything was supplied in first-class condition and to time. Outside the mill 9½ miles of new tramline have been built of 40-lb. rails on the south side of the Mulgrave to open up the Aloomba lands, the cane from which now goes to Mulgrave.

Great improvements have also taken place at the Colonial Sugar Refining Company's mill at Hambledon, which will also be now capable of dealing with 150,000 tons. A new mill has been installed, bringing the total to four, and much other machinery as well. The new area of Freshwater has been added to this mill, and the management expect to draw 50,000 tons of cane from that area this year. The enlargement of these two mills is an excellent thing for Cairns and has meant the opening up of new tracts of fertile cane lands.

The Babinda areas are presenting a good appearance, though some of the late cut ratoons are backward again this year. The grub pest is not much in evidence in the southern parts of the cane areas. The mill made a fine start on the 14th May, the cane being then of excellent sugar content. Dry weather had been experienced for about four weeks prior to this, which had greatly assisted farmers. The total rainfall from 1st January to 31st May this year had been 144 inches, as against 186 inches for the same period last year.

A later inspection of this area showed that it, too, afterwards suffered from dry weather, the rainfall from 1st June to 30th September having only been 18 inches, a phenominally low fall for Babinda. The weather conditions were responsible for the backward state of the recently cut ratoons, and to a slighter extent for the young plant cane not being more advanced than it was.

Regarding the plant cane, generally speaking the strike has been a very good one, the cane was green and healthy looking, but on the backward side. In nearly all cases it was clean and free from weeds and shows that full advantage has been taken of the dry weather to carry out thorough cultivation. The mill was doing good work, averaging well over 5,000 tons per week, and the cane supply is regular. The density figures were also good, as the average density for the 5,445 tons crushed in the week ending 30th September was 15·4 c.c.s., whilst the tons of cane to ton of sugar worked out at 6·7 tons. These figures in the Babinda area are very good indeed.

New Varieties of Canes.—Quite a number of the local growers have planted out canes from the South Johnstone Experiment Station, the principal varieties being Tableland Badila, E.K. 1, E.K. 28, Q. 903, H. 146, H.Q. 409, H.Q. 458, &c., and in most cases these germinated well.

Innisfail District (three mills).—Dry weather and a very cold winter had unfortunately made itself felt in these areas, and both the cane being harvested and also the recently planted cane showed the result. The tonnages to be cut under such conditions will naturally be under the earlier estimates. Luckily the density figures are very good.

In the South Johnstone district proper the area that looked most forward seemed to be in the neighbourhood of No. 2 branch. The ratoons recently cut looked very fair, as did also some May and June plant. A large area of this particular part of the district was being put under the plough. The Japoon area seen was disappointing, and the cane does not seem to have made much growth since early in the year, whilst the young plant cane is also backward. A large acreage of this land has also been grubbed ready for ploughing, and quite a large area has been already planted. At this juncture rain is badly needed both for the recently cut ratoons and the young plant.

The Soldiers' Settlement has progressed rapidly recently. Some seventy-seven settlers are upon their blocks of land, and about forty are delivering cane this year. The cane being cut is mostly standover Badila, and is probably the best class of cane going into the mill, as besides the tonnage being good per acre, the c.c.s. is also very satisfactory. Unfortunately, the dry weather conditions have also been felt there and the crops are on the backward side. Horse tramlines connecting the farms with the

derricks (three in number) have been laid down in central places and harvesting is in full swing. A school has been opened in the township, and quite a number of very neat homes are to be seen upon the holdings. The block holders are a fine type of hard working men and are determined to make good.

Banyan and Tully.—During a short visit paid to the Banyan and Tully River areas a large amount of good cane land was seen. The land ridden over was mostly a grey alluvial. So far only a few farmers have cane planted, owing to the uncertainty of being able to dispose of same, but the samples of Badila seen were of a very good quality indeed, whilst a few stools of M. 1900 upon Mr. Deane's farm looked good too. Just now a great deal of interest is being taken by the residents in the question of a mill for this rich district, as they recognise that with a sugar factory in operation and a through line to Townsville the potentialities of this fine sugar-growing area must be recognised.

Grubs have done very little damage to Daradgee so far this year, but borers were noticed in several scattered places. On Upper Daradgee probably some 7,000 tons of cane from new land will be handled by the mill this year. The land was formerly growing bananas, and the higher portions of each farm consist of red volcanic, whilst some fine alluvial flats fronting the river form the balance. The ground has been stumped and is now under the plough. This group of farms looks particularly well, and some splendid Badila is being cut upon them.

At Mourilyan the cane generally seems rather on the light side, the result, doubtless, of too much continuous wet last year, and the dry spell that was experienced during the growing months of this year. Not many grubs were noticed but borers were fairly evident. A fair quantity of manure is being used in this particular district, as some 550 tons are now being delivered to the various growers. Unfortunately, the excessive cost of lime makes its use nearly prohibitive to farmers.

Herbert River District (two mills).—The harvesting in this area proceeded at a great rate and with the large weekly crushing that each mill was putting through, the season's operations will finish earlier than previously anticipated.

No industrial troubles or strikes have caused delay, and everything points to a satisfactory season in this respect. The total amount of cane harvested will be under the earlier estimates, caused mainly by the dry and cold weather experienced. The autumn plant cane is backward and the ratoons are also light. With reference to the young plant cane, that also shows the effect of the dry weather.

The varieties grown on the Herbert are principally Badila and H.Q. 426 (Clark's Seedling), with lesser quantities of H.Q. 409, Black Innis, Goru, Korpi, Nanemo, Orambo, and varieties from the Sugar Experiment Stations, such as Q. 813, E.K. 1, E.K. 28, Q. 903, Q. 1121, Tableland Badila, and D. 1135.

The largest area of the latter kind was a 7-acre block of June plant upon Mr. J. Coomba's farm at Hawkin's Creek. It is the result of seed obtained from the Bundaberg Experiment Station last year, and certainly had made a fine strike, particularly at a time when the average strike of cane has been so bad. It is growing upon some very medium forest land, and Mr. Coomba intends trying it upon an area that is generally grub affected.

Another of the newer varieties to this distrist that was seen is Q. 813. Mr. Blackburn of Macknade has a paddock of this cane planted last May on a medium to poor soil. This cane looks remarkably green and healthy and also has struck splendidly. Mr. Blackburn is now cutting a 12-acre paddock of plant cane, consisting of Badila, H.Q. 409, and Q. 813. Of these three varieties the latter cane is easily the best for tonnage. Although the Q. 813 has arrowed slightly the H.Q. 409 is a mass of arrows which developed much earlier than the former.

Nearby a small patch of volunteered Q. 813 was cutting with good results, and the ratoons from same already look well, despite the dry weather.

Out of a variety of canes planted out in a paddock by Mr. W. J. Enticknap, consisting of Q. 813, E.K. 1, E.K. 2, E.K. 28, Q. 903, H. 109, and M.Q. 1 (Mowbray Seedling) the Q. 813 is easily the best. This particular paddock is only of average forest soil quality.

Tractor power on the Herbert River is becoming more popular every year now.

Unfortunately, the rat pest has been very severe upon the river this year. The C.S.R. Company are going to a great deal of trouble supplying poison baits to the farmers. Grubs have also done a certain amount of damage in places, and it is understood that the collection of beetles in the worst affected places is to be taken up again.

Borers are also very prevalent, and the entomologist of the Sugar Experiment Stations intends liberating tachinid flies in the most suitable area.

The gumming disease is causing a certain amount of anxiety to the local growers, as this year a large and scattered area is affected by it. The cane subject to same is mainly Clark's Seedling (H.Q. 426), although Badila is also affected to a slighter extent. As there is a very large proportion of this H.Q. 426 cane grown upon the Herbert, the seriousness of the situation is easily understood. In view of the above, very many enquiries are being made for a cane less susceptible to the disease. The practice of planting whole sticks of cane in the drills and then chopping same through with a cane knife, is very much to be condemned as through such methods it is impossible to detect either gum-affected cane or that suffering from borer attack.

Canegrowing is also being carried on in what are known as the Bambaroo and Yuruga districts between Ingham and Rollingstone.

Some twenty-six farmers, with an acreage of about 208 acres, are supplying the Invicta Mill from the siding between Rollingstone and Toobanna, and with any sort of decent planting weather, this number should be increased to about forty for next year. Early in the season a tonnage of over 3,000 tons was expected from the above twenty-six growers for this year, but the bad weather conditions have made these figures subject to a big reduction.

Lower Burdekin District (Four Mills).—In May last dry weather had been experienced, and many areas not irrigated were found to be dying or dead. The irrigated cane, however, looked well-grown, green, and healthy. The cane on the State Farm, Home Hill, had made excellent growth, and should cut out well. The Tableland Badila was conspicuous by its fine appearance.

The Home Hill Irrigation Scheme is now well advanced, and water is being supplied to many farmers. It is hoped that in a very short time all the farmers in the scheme will be enabled to irrigate their cane.

The Goru and Badila varieties are still holding their own in the Lower Burdekin district. A very fine crop of "Gingor" was inspected upon the farm of Mr. Crofton at Ayr. This is a cross between Mauritius Gingham and Striped Goru, raised by this gentleman, and it is doing exceptionally well, and is a good density cane. This cane is also doing remarkably well at the Experiment Station at Mackay.

The following particulars regarding the variety known as Queensland 813 should be interesting:—

	C.C.S.	Price Received. s. d.	
*Q. 813 ..	14·7 ..	54 9¾	Planted in Sept., 1921, but cut in August, 1922 (early).
,, ..	15·1 ..	56 8¾	
,, ..	14·1 ..	51 11¾	
,, ..	15·0 ..	56 3	
,, ..	16·0 ..	61 0	
,, ..	15·0 ..	56 8¾	

*The Q. 813 was cut from an 8-acre block of medium shallow forest country, and was only ploughed twice, cutting at the rate of 17 tons to the acre. Its c.c.s. however averaged nearly 16 or very much more than the average c.c.s. of the Mill for the season.

On a later visit it was noted that the grey-back cane beetle is very numerous on and about Plantation Creek (in the vicinity of Norham). The Burdekin Canegrowers' Association are fully alive to the danger and are now busy collecting beetles.

Some big cheques are being made by the various collectors—Mr. Hobson having paid one man £9 for three days' work—paying for the beetles at the rate of 1s. 6d. per quart. Another gentleman collecting has paid for 1,647 quarts between 1st and 26th December. The association are to be complimented on the energetic way that they are trying to minimise the effects of this pest.

In connection with cultivation matters generally, it is pleasing to see how this district is going ahead. Manuring is now being carried out to a very large extent. Quite a large number of growers are also using green manures and liming is becoming far more popular. Roughly speaking, there are about thirty-six tractors on the Ayr side of the river.

Owing to recent beneficial rains the whole district presents a beautiful appearance, and at present everything now points to a splendid season for 1923.

The progress of the Home Hill district during the past twelve months has been most surprising New and substantial houses are being built in every direction, and the farmers generally are optimistic as regards the future success of their cane-growing operations—that is, of course, if the price of sugar keeps up to a reasonable figure. A large number of the farms are now being supplied with water from the irrigation scheme, and a number of the farmers interviewed seemed well satisfied.

Another matter that was most noticeable was the very large number of tractors that have come here since six months ago. They are of all types, and are getting over a great deal of ground.

As regards the crushing just finished at Inkerman Mill, some 119,000 tons were put through. The State farm records show that for July, August, September, and October only 2.28 inches fell and of this amount 1·7 inches fell in July. Naturally with such dry weather conditions the cane crushed early in the season was badly dried up. Going through the areas it was noted that more attention was being paid to green manuring, liming, and using artificial manures, and most of the growers recognise the value of same.

Proserpine District (One Mill).—This area was also found to be suffering from the dry weather, as the rainfall for the seven months ending 31st July amounted only to 34·63 inches. Generally speaking, this year's crop will be a slight one, mainly on account of too much continuous wet weather last year and a shortage of rain in the growing period of this year when rain is so essential, the result being that the autumn plant cane has not made the growth that it should, and the ratoons are also very backward. The mill started crushing on 3rd August, and for a time the cane supply was short, owing to so many growers being busy in planting operations.

Going through the district the outstanding feature is certainly the very large acreage that is being planted up for next year. In every part of the area this was most noticeable, and it is to be hoped that seasonable weather conditions will enable the mill to handle a big crop. With all the spare land that is to be found in the Proserpine area, the local mill should be crushing a great deal more cane than now goes through the rollers.

The principal canes grown in this district so far are the Gorus (N.G. 24, 24 A, 24 B), Clark's Seedling (H.Q. 426), Malagache, Badila, with smaller quantities of D. 1135, Striped Singapore, M. 1900, and the newer varieties, such as E.K. 1, Q. 813, Q. 855, Q. 903, Q. 1121, and Q. 116. Of these H.Q. 426 is still a great favourite here, and the cane now being crushed certainly justifies its popularity. Q. 813 also gave very fine average results in density last season, being second only to H.Q. 426.

On a later visit it was learned from inquiries at the mill that 34,167 tons of cane had been crushed for an average of 14·95 c.c.s., some 4,610 samples were taken on an average of one for every 7·4 tons of cane. Below is a list giving particulars of the cane crushed:—

Variety.	Average c.c.s.	Per cent of crop.
H.Q. 426	15·6 ..	26
Q. 813	15·5 ..	9
B. 147, B, 208, Q. 1121, Q. 114, and Q. 116	15·5 ..	3
Badila	15·4 ..	10
M. 1900	15·2 ..	5
Mixed varieties	14·4 ..	12
Goru	14·2 ..	13
S. Singapore	14·2 ..	6
D. 1135	14·2 ..	6
Malagache	14·1 ..	10
		100

It will be noticed that again this year H.Q. 426 is easily the favourite, but is run a good second by Q. 813, whilst the 3 per cent. of B. 147, B. 208, Q. 1121, Q. 114, and Q. 116 are also very high in sugar contents.

When the very dry nature of the season is taken into consideration it is really wonderful to see how well some blocks of plant cane are looking. Most of them, however, are adjacent to either the river or creek banks.

Probably more cultivation has been put into the Proserpine cane area this year than in any former one, and it is thanks to such continual work that the cane still holds out so well under such adverse weather conditions.

Whilst in the Proserpine area a visit was paid to Banana Pocket. Here also the conditions were very dry, although better than in Proserpine proper. Since last visit several new farms have been opened up, and there are now twelve or fourteen growers in residence.

It is to be hoped that all the available land in this area will soon be under cane, as the Proserpine Mill is in need of such cane.

Mackay District (Eight Mills).—Since the publication of last report the Homebush Mill in this district has been closed and removed, the cane supply having been transferred to the Farleigh Mill. The Farleigh Company are railing the Homebush cane along their tramway to Rosella, then transferring it to the 3 feet 6 inches line which runs to Farleigh Mill. This has meant great alterations at Rosella. A loop line was built of 2-feet gauge which runs alongside a length of 4 feet 8½-inch gauge on which travels a locomotive crane capable of handling 300 tons of cane every eight hours. The crane is worked two shifts, thus providing for the transfer of 600 tons of cane per day. The yard is lit by electricity, and weighbridge facilities are also erected. This is a big scheme, and its successful operation will be of the utmost advantage to the late Homebush Mill suppliers.

The climatic conditions at Mackay have also held the crop back, and the mills have all been obliged to reduce their estimates. It is most unfortunate that the usual wet season this year did not put in an appearance, as the rainfall previous to the end of last year was good and sent the cane crops well ahead. A good deal of new land is being opened up about Mackay. In addition to the fine cane areas at Carmilla about 1,000 acres of first class forest and scrub land have been sold at the Pinnacle on the Hatton line, also new areas near to Carmilla on the Mackay-Rockhampton line are being opened up for cane growing.

Varieties which gave good returns this season are Q. 813, with an approximate average of 16 c.c.s.; M. 1900 Seedling, density 17 c.c.s; Malagache, 14 c.c.s.; M. 189, 17 c.c.s.; Badila, 17 c.c.s.; and Q. 970, 16 c.c.s.

The cane on the fertile flats in the vicinity of Finch Hatton probably cut heavier tonnages than elsewhere in the Mackay district, and the c.c.s. value of the cane was uniformly high.

Bundaberg and Gin Gin (Five Mills).—The cane crops at the beginning of the year had made good progress, and the mill estimates were heavy. Dry weather, however, set in and the crops lost ground for a period, the estimates being reduced. Good rains fell in July, increasing the prospects again. A few frosts were experienced, but did no serious harm. As the season progressed, however, very fair crops were cut; in fact, much better than was originally expected after the prolonged dry spell following the Christmas rain. Most of the cane for next year's crop is in good condition, the young ratoons and plant cane making a good showing. Varieties looking well are M. 1900, Q. 813, H.Q. 285, Badila, and Shahjahanpur No. 10. Good cultivation is in evidence on most farms.

The cane at Bingera was healthy and of good appearance. Cane varieties doing well on the farms are Q. 813, E.K. 1, M. 1900, and D. 1135. The young plant crop looks well, and the ratoons are coming away vigorously. No sign of serious disease is in evidence, nor any marked grub infestation.

Although the long spell of dry weather at Gin Gin militated seriously against the chance of cutting a big crop, the returns from the Gin Gin areas this year were very fair. The farming is all of a high standard, and the growers are keen on raising the best cane available. Since the subdivision of the Watawa Plantation several new farmers have started on these lands and are doing well.

Isis District (Three Mills).—The cane in this district is cutting well, and the field workers are giving satisfaction to the growers. The density is good, and is gradually improving. The most satisfactory variety in this latter respect is Mauritius 1900 Seedling. Other varieties are doing well, however, the farmers having no complaints to make against the returns of D. 1135, Black Innis, Petite Senneville, and Q. 813.

The Isis Central Mill has been brought up to date by the installation of a new 10-ton pan, a large extra effet, a fine spray system in place of the old water tower, new Edwards dry air pump of special design, new duplex reciprocal pump, and centrifugal pumps. These improvements have been made under the supervision of the manager, Mr. J. Alison. Doolbi Mill has also had new machinery installed and a number of ingenious automatic devices at various stations are saving labour and regulating deliveries. These are principally the invention of the manager, Mr. G. Francis, who was assisted in some particulars by the mill overseer, Mr. G. Stevenson.

Maryborough and Pialba (One Mill).—The cane is looking well in this district and the acreages are gradually being extended. There is still a fair amount of land outside Maryborough that could and probably will be planted, provided the price of sugar is sufficiently encouraging. This applies in a large degree to that tract of forest country that is lying between the city and Tiaro, where, excepting for frosted places, quite a lot of cane could be grown.

The Pialba district looks very fine at present. The farmers have had good rains and the young crops, plant and ratoon, look forward and healthy. The canegrowers are paying more attention to scientific methods of production, and the result of this is to be seen on some of the plant cane, and the appearance of the soil

which has been rendered friable by the use of lime and intensive cultivation. Great credit is also due to those gentlemen who have variety plots for the care and discrimination with which they are looking after them. Regarding cane varieties those that are at present looking promising are Q. 813, E.K. 1, E.K. 28, Shahjahanpur No. 10, M. 1900 Seedling, and Demerara 1135. J. 247 is a cane that is also making a good showing.

Mount Bauple (One Mill).—There is every prospect of a good season at Bauple next year. Splendid rains have fallen, in some instances a little too heavy, causing washaways in places, but, on the whole, the district has benefited greatly. The young plant cane and ratoons are very healthy and forward, showing no disease or evidence of insect parasite attack. The farmers are busy keeping down the weed growth and cultivating, the latter being necessary to ensure against evaporation and caking of soil after the heavy rain. The farmers here are recommended to eliminate discarded varieties as much as possible, and only grow those canes which are likely to develop into good canes.

Regarding the districts between Mount Bauple and Nambour, with the exception of Yandina, very little cane is growing at present. There is a big colony of ex-service men in these districts who have farms, and who are looking toward the sugar industry as a means of making a living.

Nambour (One Mill).—Progress is being made in this district with canegrowing. More attention is being paid to the question of liming and draining, especially on Petrie's Creek and the Maroochy River, and the effect of these measures is already evident. The crushing here this year will be a good one. Conditions in this respect are better than was to be expected, as the heavy rains of early in the year were followed by an intensely dry period.

In the Mapleton district good progress is also being made with canegrowing.

At Yandina, which is on the Maroochy River, there is a considerable acreage of cane. The variety Q. 813 is making an exceptionally good showing, also H.Q. 285.

Beenleigh (Five Mills).—Renewed interest in sugar production is being taken in this district. Growers are increasing their acreages under cane and taking a greater interest in varieties that are likely to give better c.c.s. results than those hitherto raised on Beenleigh areas. This is an important matter both for the sugar mills and the farmers. The producers of sugar should gradually eliminate the old and more susceptible varieties to disease from their farms, and gradually work in such useful canes as E.K. 1, Q. 813, Q. 970, and Q. 1098. Such canes as D. 1135, Badila, M. 1900 Seedling, and Malagache, which are already fairly extensively planted, should be retained.

The Beenleigh District Show was a great success this year, the cane exhibit being especially good. Much interest was also taken in the cane exhibits of the Bureau of Sugar Experiment Stations (non-competitive).

4.—WORK OF THE NORTHERN SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE, NEAR INNISFAIL.

The piece of land used as a site for the Northern Sugar Experiment Station was selected owing to its being Crown land. It is situated at the foot of the Basilisk Range, upon the opposite side of the river to the South Johnstone Mill. The land is of poor quality, low in available phosphoric acid and lime, and, like most of the soils in the neighbourhood, contains a larger percentage of magnesia than lime.

The chemist in charge of this station is Mr. P. H. McWalters, a returned soldier with considerable experience both in chemistry and agriculture.

Mr. McWalters has carried out his duties in a most satisfactory manner, and his warm interest in the work is to be highly commended. The station, due to its location, has at the present time a number of drawbacks which should, however, be overcome when the North Coast Railway has been completed to Cairns. One of the principal difficulties at present is the getting away of cane varieties to farmers between Innisfail and Cairns, from which places numerous applications are received. This has all to be packed, sent across the South Johnstone River, conveyed by train across the North Johnstone River, and loaded into the broad gauge at Garradunga.

A commencement with Experiment Station work was made in 1919, when a number of varieties were sent to this Station from Mackay and Bundaberg, as under:—

From Mackay.—Q. 1133, 1098, 1092, 855, 812 A, 1121, 970, 903, 813, N.G. 24, 24 A, 24 B, Badila Seedling, Hybrid No. 1, Petite Senneville, Q. 695, M. 87, M. 89, N.G. 16, H.Q. 426, 458, 7 R. 428, and 8 R. 431.

From Bundaberg.—Hawaii 109, 227, 146; Java E.K. 1, E.K. 2, E.K. 28; 100 Bont, 247 H.Q. 77, Mauritius 168^{04}, South Africa Yuban or Uba.

Canes were also sent down from the Kairi State Farm, near Atherton, where they had been sent in 1913. During the interval they have been grown on the Tableland in the hope that they would throw off disease and become sound, healthy canes. The varieties which came down to Innisfail were—Rose Bamboo, or Rappoe, Meera, Striped Singapore, Goru, and Badila. Other varieties have been forwarded from time to time from the Mackay and Bundaberg Experiment Stations and other sources.

A well-appointed laboratory has been installed, so that Northern farmers will be able to get soils, waters, limestones, fertilisers, and sugar-canes tested free of charge.

Meteorological.

The following notes upon weather conditions during the growing period have been furnished by the Chemist in Charge:—

The weather conditions for the period September, 1921, to August, 1922, could not be regarded as favourable for the growth of cane. The season did not reflect average Johnstone conditions—the rainfall being spasmodic and of uneven distribution, and the extreme changes to cold snaps which began as early as March completely checked the cane's growth.

This condition of affairs, although widely diffused in the Badila cane throughout the district has had no serious effect on the density or maturing of canes, but has caused a decrease in the weight of stalks, by the formation in some instances of "dead heart," or the non-development of the central shoot and throwing of new growths from the top buds. The existence of top rot at the vegetative point of the cane has not been felt by the mills, but this has been chiefly due to the favourable winter and the long period of dry weather which has considerably reduced the factor of deterioration.

Taking a monthly review of the growing period of the season, it may be remarked that in the early months—September to November, 1921—the ratoons showed little vitality. This was due to a certain amount of soil exhaustion not actually the result of the previous heavy crop, but the outcome of the heavy wet year, and the extension of rains through the winter.

The tillering capacity of the ratoons—particularly the older stubbles—was considerably reduced by the borer, which was noted to be very prevalent, and this factor co-operating with the reduced vigor of canes accounted for an unusually high percentage of stools dying out.

Beneficial rains commenced to fall on the 18th December, extending to 3rd January, 1922.

The period, 4th January to 5th February, in which only 165 points of rain were recorded, checked the cane's growth, and some of the ratoons in the district were showing signs of perishing. Favourable rains commenced to fall on 6th February, and a period of good moistures and high humidity extending to the middle of March put the canes in excellent condition of growth.

Although the canes at this period were looking well throughout the whole district, they were still considerably backward in growth compared to average years, and this, to a certain extent, was due to late milling operations, and a large percentage of late plantings.

The disappointing cold weather which set in from the middle of March and extended to early in April, had such a bearing on the physiology of canes, that the Badila was disposed to make little further headway during the remainder of the growing period. Good rains were experienced from the middle of April and into the month of May, and although the temperatures improved, the setting in of an early winter brought little acceleration to the further growth of canes.

The mills, however, made early starts on canes of good densities, and fully matured canes have been obtained at the beginning of the crushing campaign.

Rainfall Registered at the Sugar Experiment Station, South Johnstone, During the Growing Period, September, 1921, to August, 1922.

	Inches.
September, 1921	9·62
October, 1921	7·79
November, 1921	1·27
December, 1921	20·21
January, 1922	7·43
February, 1922	41·74
March, 1922	18·10
April, 1922	10·76
May, 1922	9·34
June, 1922	5·81
July, 1922	3·17
August, 1922	·62
Total	135·86

Number of wet days, 147.

Number of wet days for previous period 1920-1921, 206.

Experiment Work.

The experiments dealt with in the following section comprise:—

1. Continuation of fertilising experiments with a first ratoon crop (Badila).
2. Experiments in different methods of ratooning first ratoon crop (Badila).
3. Experiments with subsoiling against no subsoiling with and without mixed fertilisers.
4. Tests of different variety canes.
5. Experiments in raising Seedling canes.

1. Fertilising Experiments with N.G. 15 or Badila—First Ratoons.

In September of 1919 a series of plots were laid out on a large scale to test the effect of fertilisers. At that time manures were very difficult to obtain, and it was not possible to lay out complete fertiliser tests. All that could be done was to make use of such fertilisers as could be then obtained.

The series consisted of fourteen plots, occupying about 5½ acres. The cane used for the experiments was Badila or N.G. 15. It was planted towards the end of September, and came away well. The land had been well worked, having been ploughed four times to 12 inches deep, prior to planting. The results of the plant and first ratoon crops have already appeared in previous reports, but will be found lower down in the total crop results.

The chemical examination and crop results for this year of the second ratoon crop are given hereunder :—

ANALYTICAL RESULTS OF EXPERIMENTS, WITH AND WITHOUT MANURES—N.G. 15 OR BADILA 2ND RATOONS—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sucrose in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
1	N.G. 15 or Badila	No manure	11 months	28 Aug.	20·50	18·73	91·36	12·0	15·54	14·60
2	N.G. 15 or Badila	Holbourne Island Phosphate, containing 17 per cent. P_2O_5, and 10 per cent. lime carbonate. Rate, 485 lb. per acre	11 months	28 Aug.	20·60	19·00	92·20	12·0	15·74	14·86
3	N.G. 15 or Badila	No manure	11 months	28 Aug.	21·26	19·33	90·90	12·0	16·04	15·03
4	N.G. 15 or Badila	Superphosphate, containing 15 per cent. P_2O_5. Rate, 550 lb. per acre	11 months	28 Aug.	19·76	18·63	94·28	12·0	15·46	14·80
5	N.G. 15 or Badila	No manure	11 months	28 Aug.	21·10	19·50	92·40	12·0	16·18	15·31
6	N.G. 15 or Badila	Sulphate of ammonia, 200 lb. per acre	11 months	28 Aug.	21·08	19·37	91·80	12·0	16·07	15·15
7	N.G. 15 or Badila	No manure	11 months	28 Aug.	21·88	20·35	93·0	12·0	16·89	16·04
8	N.G. 15 or Badila	Nitrate of soda, 266 lb. per acre	11 months	28 Aug.	21·68	20·16	92·9	12·0	16·73	15·89
9	N.G. 15 or Badila	No manure	11 months	28 Aug.	20·88	19·37	92·7	12·0	16·08	15·25
10	N.G. 15 or Badila	Sulphate of ammonia, 250 lb.; and superphosphate, 550 lb. per acre	11 months	29 Aug.	20·50	19·06	92·9	12·0	15·82	15·02
11	N.G. 15 or Badila	No manure	11 months	29 Aug.	19·78	18·30	92·5	12·0	15·19	14·31
12	N.G. 15 or Badila	Holbourne Island Phosphate, 485 lb., and sulphate of ammonia, 250 lb. per acre	11 months	29 Aug.	20·40	18·78	92·0	12·0	15·58	14·70
13	N.G. 15 or Badila	No manure	11 months	29 Aug.	20·87	19·58	93·8	12·0	16·25	15·51
14	N.G. 15 or Badila	Holbourne Island Phosphate, 485 lb. per acre	11 months	29 Aug.	21·28	20·04	94·1	12·0	16·63	15·91

CROP RESULTS OF EXPERIMENTS, WITH AND WITHOUT MANURES—N.G. 15 OR BADILA 2ND RATOONS—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	N.G. 15 or Badila	No manure	11 months	26·02	4·03	3·80
2	N.G. 15 or Badila	Holbourne Island Phosphate, containing 17 per P_2O_5, and 10 per cent. lime carbonate. Rate 485 lb. per acre	11 months	32·44	5·11	4·82
3	N.G. 15 or Badila	No manure	11 months	31·36	5·03	4·70
4	N.G. 15 or Badila	Superphosphate containing 15 per cent. P_2O_5. Rate, 550 lb. per acre	11 months	37·72	5·83	5·58
5	N.G. 15 or Badila	No manure	11 months	36·12	5·84	5·53
6	N.G. 15 or Badila	Sulphate of ammonia, 200 lb. per acre ..	11 months	29·15	4·68	4·42
7	N.G. 15 or Badila	No manure	11 months	26·27	4·43	4·21
8	N.G. 15 or Badila	Nitrate of soda, 266 lb. per acre	11 months	26·53	4·44	4·21
9	N.G. 15 or Badila	No manure	11 months	24·96	4·01	3·81
10	N.G. 15 or Badila	Sulphate of ammonia, 250 lb., and superphosphate, 550 lb. per acre	11 months	25·60	4·05	3·84
11	N.G. 15 or Badila	No manure	11 months	27·17	4·13	3·89
12	N.G. 15 or Badila	Holbourne Island Phosphate, 485 lb., and Sulphate of ammonia, 250 lb. per acre	11 months	29·22	4·55	4·29
13	N.G. 15 or Badila	No manure	11 months	32·16	5·23	4·98
14	N.G. 15 or Badila	Holbourne Island Phosphate, 485 lb. per acre	11 months	31·23	5·19	4·97

The crop results of the second ratoons are not as consistent with the plant and first ratoon crops as could be desired, and is perhaps due to the varying amounts of dead cane found on the different blocks. This year the plot treated with superphosphate is well in the lead over other manured plots. The Holbourne Island phosphate this year has given the biggest yield over the next unmanured plot.

The increase for the different fertilisers is shown as follows:—

Comparison of Results of Fertiliser Experiment Plots.

Plot 1.—No manure ..	Increase for manure—
„ 2.—300 lb. Holbourne Island Phosphate per acre	6·42 tons cane
„ 3.—No manure ..	Increase for manure—
„ 4.—550 lb. Superphosphate per acre	6·36 tons cane
„ 5.—No manure	Decrease for manure—
„ 6.—200 lb. Sulphate of Ammonia per acre	6·97 tons cane
„ 7.—No manure ..	Increase for manure—
„ 8.—Nitrate of Soda, 266 lb. per acre	0·26 tons cane
„ 9.—No manure ..	Increase for manure—
„ 10.—Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre	0·64 tons cane
„ 11.—No manure ..	
„ 12.—Holbourne Island Phosphate, 300 lb.; and Sulphate of Ammonia, 250 lb. per acre	Increase for manure— 2·05 tons cane
„ 13.—No manure ..	
„ 14.—Holbourne Island Phosphate, 300 lb. per acre	Decrease for manure— 0·93 tons cane

Note.—The amounts of phosphoric acid in Holbourne Island fertiliser and superphosphate, and nitrogen in nitrate of soda and sulphate of ammonia were calculated to equivalents in the amounts applied.

The highest increase this year is in plot 2, with Holbourne Island phosphate, over plot 1—no manure. In explanation of this, however, it has to be remembered that plot 1 is poorer in quality than either plots 2 or 3, being nearer the Basilisk Mountain. Therefore plot 2 should be compared with the average of plots 1 and 3, which is done below.

Plots 3 and 4 with superphosphate and no manure show a good difference also. Plots 5 and 6 show an actual decrease, while for plots 7, 8, 9, and 10 the increase for the use of fertilisers is very small. A decrease for the use of Holbourne Island phosphate is shown between 13 and 14, which have hitherto given a marked difference in favour of the phosphate.

In making a comparison between the manured and the unmanured plots, perhaps fairer figures may be obtained by comparing three plots—*i.e.*, the manured plot and the average of the unmanured plots on each side—as under.

Comparison of Manured Plots by taking the Average of the Two Unmanured Plots at Each Side.

Plots 1, 2, 3 ..	Increase for manure 3·75 tons cane
Plots 3, 4, 5 ..	Increase for manure 3·98 tons cane
Plots 5, 6, 7 ..	Decrease for manure 2.04 tons cane
Plots 7, 8, 9 ..	Increase for manures 0·92 tons cane
Plots 9, 10, 11..	Decrease for manure 0·46 tons cane
Plots 11, 12, 13..	Decrease for manure 0·44 tons cane

Taking the figures in this way, the highest yield in the second ratoons is that of the superphosphate on plot 4, with Holbourne Island phosphate on plot 2 as second.

The analytical results to date are given hereunder:—

Analytical Results to Date of Experiments With and Without Manures.

Plot No.	Treatment.	% C.C.S. Plant Crop.	% C.C.S. 1st Ratoon.	% C.C.S. 2nd Ratoon.	Average C.C.S. 3 Crops.	Total Tons. C.C.S. 3 Crops.
1	No manure	14·94	15·10	14·60	14·90	13·61
2	Holbourne Island Phosphate, 485 lb. per acre ..	14·65	14·08	14·86	14·47	16·17
3	No manure	14·69	15·45	15·03	15·07	16·31
4	Superphosphate, 550 lb. per acre	14·46	14·60	14·80	14·62	17·13
5	No manure	14·28	12·93	15·31	14·08	15·80
6	Sulphate of Ammonia, 200 lb. per acre	14·27	12·90	15·15	13·93	14·92
7	No manure	13·30	13·17	16·04	13·94	14·21
8	Nitrate of Soda, 266 lb. per acre	13·46	13·67	15·89	14·14	15·13
9	No manure	12·78	12·95	15·25	13·45	13·68
10	Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre	12·76	13·77	15·02	13·67	14·79
11	No manure	13·57	12·79	14·31	13·41	15·23
12	Holbourne Island Phosphate, 485 lb.; and Sulphate of Ammonia, 250 lb. per acre	13·96	12·81	14·70	13·72	15·55
13	No manure	12·46	13·22	15·51	13·59	15·36
14	Holbourne Island Phosphate, 485 lb. per acre ..	13·94	14·10	15·91	14·60	17·30

The crop results to date are as follow:—

CROP RESULTS TO DATE OF EXPERIMENTS WITH AND WITHOUT MANURES—N.G. 15 OR BADILA—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Plant Crop, 1920.		1st Ratoon Crop, 1921.		2nd Ratoon Crop, 1922.		Average Yield of Cane per acre, 3 years, in English tons.
			Yield of Cane per acre in English tons.	Yield of Commercial Cane Sugar per acre in English tons.	Yield of Cane per acre in English tons.	Yield of Commercial Cane Sugar per acre in English tons.	Yield of Cane per acre in English tons.	Yield of Commercial Cane Sugar per acre in English tons.	
1	N.G. 15 or Badila	No manure	27·68	4·13	37·64	5·68	26·02	3·80	30·44
2	N.G. 15 or Badila	Holbourne Island Phosphate, containing 17 per cent. P_2O_5, and 10 per cent Lime carbonate. Rate, 485 lb. per acre	32·51	4·76	46·80	6·59	32·44	4·82	37·90
3	N.G. 15 or Badila	No manure	31·26	4·59	45·58	7·02	31·36	4·70	36·03
4	N.G. 15 or Badila	Superphosphate, containing 15 per cent. P_2O_5. Rate, 550 lb. per acre	33·24	4·81	46·16	6·74	37·72	5·58	39·04
5	N.G. 15 or Badila	No manure	32·28	4·61	43·8	5·66	36·12	5·53	37·40
6	N.G. 15 or Badila	Sulphate of Ammonia, 200 lb. per acre ..	33·37	4·76	44·55	5·74	29·15	4·42	35·69
7	N.G. 15 or Badila	No manure	33·63	4·47	42·00	5·53	26·27	4·21	33·76
8	N.G. 15 or Badila	Nitrate of Soda, 266 lb. per acre ..	35·23	4·74	45·19	6·18	26·53	4·21	35·65
9	N.G. 15 or Badila	No manure	35·00	4·47	41·71	5·40	24·96	3·81	33·89
10	N.G. 15 or Badila	Sulphate of Ammonia, 250 lb.; and Superphosphate, 550 lb. per acre	39·73	5·06	42·80	5·89	25·60	3·84	36·04
11	N.G. 15 or Badila	No Manure	39·54	5·36	46·80	5·98	27·17	3·89	37·83
12	N.G. 15 or Badila	Holbourne Island Phosphate, 485 lb.; and Sulphate of Ammonia, 250 lb. per acre	42·80	5·97	41·30	5·29	29·22	4·29	37·77
13	N.G. 15 or Badila	No manure	40·76	5·08	40·10	5·30	32·16	4·98	37·67
14	N.G. 15 or Badila	Holbourne Island Phosphate, 485 lb. per acre	41·81	5·83	46·10	6·50	31·23	4·97	39·71

From the total crop results we may make comparisons of the average figures for the plant, first and second ratoon crops, by again comparing three plots:—

No Manure.	Manure.	No Manure.	Average Increase in Plant, First and Second Ratoon Crops.
Plots 1 ..	2	3	4·67
Plots 3 ..	4	5	2·33
Plots 5 ..	6	7	0·11
Plots 7 ..	8	9	1·80
Plots 9 ..	10	11	0·08
Plots 11 ..	12	13	0·02
Plots 13 ..	14	..	2·04

This puts the Holbourne Island phosphate in the lead for the three crops followed by the superphosphate. The yields for the other manures were exceedingly small. This is probably due to the fact that they were far more soluble fertilisers, and were leached out in the heavy rains of the Innisfail district. This question needs further experimenting with in order to arrive at a definite conclusion.

The tonnage returns in this experiment were very satisfactory, the returns from the crop of second ratoons being excellent. The yield from the first ratoon crop was better than from the plant crop.

The cost of the fertilisers and their application was as under:—

	£	s.	d.		£	s.	d.
Plot 2..	1	14	8 per acre	Plot 10..	5	12	0 per acre
Plot 4..	3	2	7 per acre	Plot 12..	4	7	3 per acre
Plot 6..	2	6	3 per acre	Plot 14..	1	14	8 per acre
Plot 8..	2	7	0 per acre				

As the result from the second ratoon crop was so good, it has been determined to allow one half of this area to go on to a third ratoon crop.

2.—EXPERIMENTS IN DIFFERENT METHODS OF RATOONING—SECOND RATOON CROP.

In 1919 a large area of Badila was planted for revenue purposes. After cutting the plant crop, experiments with different methods of ratooning were initiated. The treatment was as follows:—

Plot 1.—Cane allowed to volunteer through trash.

Plot 2.—Trash rolled into alternate interspaces, and every other interspace cultivated.

Plot 3.—Trash burnt, interspaces cultivated by ploughing four furrows.

Plot 4.—Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling each furrow.

Plot 5.—Trash burnt, interspaces cultivated with disc harrow only.

Below are given the analytical results of the second ratoon crop which, as in the preceding year's crop, were fairly uniform.

ANALYTICAL RESULTS OF EXPERIMENTS IN DIFFERENT METHODS OF RATOONING—SECOND RATOON BADILA—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Brix of Juice.	% Sugar in Juice.	Purity of Juice.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
1	Badila ..	Cane volunteered through trash	11 months	25 Aug.	20·40	18·97	92·9	12·0	15·74	14·94
2	Badila ..	Trash rolled into alternate interspaces, and every other interspace cultivated	11 months	25 Aug.	20·91	19·53	93·4	12·0	16·21	15·43
3	Badila ..	Trash burnt, interspaces cultivated by ploughing four furrows	11 months	25 Aug.	20·10	18·48	91·9	12·0	15·34	14·47
4	Badila ..	Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling	11 months	25 Aug.	20·60	19·11	92·7	12·0	15·86	15·04
5	Badila ..	Trash burnt, ratooned with disc harrow only	11 months	25 Aug.	20·20	18·30	90·59	12·0	15·19	14·20

The following table shows the crop results:—

CROP RESULTS OF EXPERIMENTS IN DIFFERENT METHODS OF RATOONING—SECOND RATOON BADILA—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Badila ..	Cane volunteered through trash	11 months	23·40	3·68	3·50
2	Badila ..	Trash rolled into alternate interspaces, and every other interspace cultivated	11 months	24·74	4·01	3·82
3	Badila ..	Trash burnt, interspaces cultivated by ploughing four furrows	11 months	22·69	3·48	3·28
4	Badila ..	Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling	11 months	25·86	4·10	3·89
5	Badila ..	Trash burnt, ratooned with disc harrow only ..	11 months	21·67	3·29	3·08

The analytical and crop results to date are given hereunder:—

ANALYTICAL RESULTS TO DATE OF EXPERIMENTS IN DIFFERENT METHODS OF RATOONING.

Plot No.	Treatment.	% C.C.S. 1st Ratoons.	% C.C.S. 2nd Ratoons.	Average C.C.S. Two Crops.	Total Tons. C.C.S. Two Crops.
1	Cane volunteered through trash	12·50	14·94	13·39	8·57
2	Trash rolled into alternate interspaces and every other interspace cultivated	12·05	15·43	13·38	8·30
3	Trash burnt, interspaces cultivated by ploughing four furrows ..	12·80	14·47	13·38	8·55
4	Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling	12·46	15·04	13·41	9·28
5	Trash burnt, ratooned with disc harrow only	13·08	14·20	13·45	8·66

CROP RESULTS TO DATE OF EXPERIMENTS IN DIFFERENT METHODS OF RATOONING—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	First Ratoon, 1921.		Second Ratoon, 1922.		Average Two Crops.
			Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.
1	Badila ..	Cane volunteered through trash	40·6	5·07	23·4	3·50	32·00
2	Badila ..	Trash rolled into alternate interspaces, and every other interspace cultivated	37·3	4·48	24·74	3·82	31·02
3	Badila ..	Trash burnt, interspaces cultivated by ploughing four furrows	41·2	5·27	22·69	3·28	31·94
4	Badila ..	Trash burnt, interspaces cultivated by ploughing four furrows and subsoiling	43·3	5·39	25·86	3·89	34·58
5	Badila ..	Trash burnt, ratooned with disc harrow only	42·7	5·58	21·67	3·08	32·18

Plot 4, which was ratooned according to the method advocated by the sugar experiment stations as being generally the best, gave the highest yield in both the first and second ratoon crops. This year the lowest yield was in plot 4, ratooned with the disc harrow only. This plot was 4·2 tons of cane per acre under plot 5.

Taking the average figures as given in the final column of the above table, it will be seen that there was little difference in the results from plots 1, 2, 3, and 5.

3.—Experiment to Determine the Value of Subsoiling With and Without Mixed Fertilisers.

The results of subsoiling at the Mackay station have uniformly proved profitable and successful. It was therefore determined to lay down subsoiled plots *versus* no subsoiling with and without manure. The opinion was expressed by old farmers in the Innisfail district that, owing to the large quantity of rain falling during the year and the porous nature of the soil, subsoiling would not be found of any great advantage, and this view was supported in the yield of the plant crop. The present crop of first ratoons has given a somewhat different result, probably owing to its being a much dryer year.

Below will be found the analytical table:—

Analytical Results of Experiments to Determine the Value of Subsoiling—First Ratoon Badila—September, 1922.

Plot Number.	Variety of Cane.	Treatment.	Date of Analysis.	Age of Cane.	Brix of Juice.	% Sugar in Juice.	Quotient of Purity.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
1	Badila ..	Not subsoiled—no fertiliser	31 Aug.,	10½ months	19·92	18·40	92·37	11·00	15·45	14·61
2	Badila ..	Subsoiled—no fertiliser ..	1 Sep.	10½ months	18·22	16·23	89·07	11·00	13·63	12·62
1A	Badila ..	Not subsoiled—fertiliser applied as follows:—200 lb. Superphosphate, 200 lb. Sulphate of Ammonia, and 100 lb. Muriate of Potash	31 Aug.	10½ months	19·36	17·03	87·96	11·00	14·30	13·13
2A	Badila ..	Subsoiled—fertiliser applied as follows:—200 lb. Superphosphate, 200 lb. Sulphate of Ammonia, and 100 lb. Muriate of Potash	1 Sep.	10½ months	19·50	17·53	89·9	11·00	14·72	13·70

The crop results from the first ratoon crop appear hereunder:—

Crop Results of Experiments to Determine the Value of Subsoiling—First Ratoon Badila—September, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Total Yield of Sugar per Acre.	Yield of Commercial Cane Sugar per Acre.
1	Badila ..	Not subsoiled—no fertiliser	10½ months	31·81	4·91	4·64
2	Badila ..	Subsoiled—no fertiliser	10½ months	41·62	5·67	5·25
1A	Badila ..	Not subsoiled—fertiliser applied as follows:—200 lb. Superphosphate, 200 lb. Sulphate of Ammonia, and 100 lb. Muriate of Potash	10½ months	41·38	5·92	5·43
2A	Badila ..	Subsoiled—fertiliser applied as follows:—200 lb. Superphosphate, 200 lb. Sulphate of Ammonia, and 100 lb. Muriate of Potash	10½ months	44·80	6·59	6·14

Difference in favour of subsoiling unfertilised plots, 9·81 tons of cane and ·61 tons of sugar per acre.
Difference in favour of subsoiling fertilised plots, 3·42 tons of cane and ·71 tons of sugar per acre.

From the above table it is apparent that the subsoiling in the non-fertilised plots made a considerable difference this season, the increased yield in favour of subsoiling amounting to 9·81 tons of cane and ·61 tons of sugar per acre. The increase between the subsoiled and non-subsoiled plots where mixed fertilisers had been applied is not so marked, amounting to 3·42 tons of cane and ·71 tons of sugar per acre; but even this would be highly profitable. It is shown, with respect to plots 1 and 2 where the increased yield was 9·81 tons of cane, that this was almost equivalent to the increase caused by the application of mixed fertilisers, and was secured at a much lower cost.

The tables of analytical and crop results to date of this experiment now follow:—

ANALYTICAL RESULTS TO DATE OF EXPERIMENTS TO DETERMINE THE VALUE OF SUBSOILING.

Plot No.	Treatment.	% C.C.S. Plant Crop.	% C.C.S. First Ratoon.	Average C.C.S. Two Crops.	Total Tons C.C.S. Two Crops.
1	Not subsoiled, no fertiliser	14·52	14·61	14·54	11·86
2	Subsoiled, no fertiliser	13·24	12·62	12·94	11·57
1A	Not subsoiled, fertiliser applied as above	12·90	13·13	12·99	12·73
2A	Subsoiled, fertiliser applied as above	13·75	13·70	13·72	13·89

CROP RESULTS TO DATE OF EXPERIMENTS IN SUBSOILING VERSUS NO SUBSOILING—SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Plant Crop, 1221.		First Ratoon, 1922.	
			Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Badila ..	Not subsoiled, no fertiliser	49·74	7·22	31·81	4·64
2	Badila ..	Subsoiled, no fertiliser	47·76	6·32	41·62	5·25
1A	Badila ..	Not subsoiled, fertiliser applied as above ..	56·60	7·30	41·38	5·43
2A	Badila ..	Subsoiled, fertiliser applied as above	56·38	7·75	44·80	6·14

AVERAGE RESULTS OF ABOVE.

Plot No.	Variety of Cane.	Treatment.	Average Yield of Cane. Two Crops.	Average Yield of Commercial Cane Sugar.
1	Badila	Not subsoiled, no fertiliser	40·77	5·93
2	Badila	Subsoiled, no fertiliser	44·69	5·78
1A	Badila	Not subsoiled, fertiliser applied as above	48·99	6·36
2A	Badila	Subsoiled, fertiliser applied as above	50·59	6·94

Difference in favour of subsoiling two crops, Nos. 1 and 2, no fertiliser; 3·92 tons of cane.

Difference in favour of subsoiling two crops, Nos. 1A and 2A, fertiliser used; 1·60 tons of cane.

4.—ANALYTICAL TESTS OF DIFFERENT VARIETY CANES.

Analyses were made of plant and first ratoon varieties growing upon the station in July and August, as detailed below:—

ANALYSIS VARIETY PLANT CANES—SEASON 1922.

Name of Variety.	Age.	Date of Analysis.	Brix. of Juice.	% Sugar in Juice.	Quotient.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
M. 55/1182	12 months	26 July	18·4	16·62	90·3	10·9	13·98	13·05
M. 55/11	12 months	26 July	16·2	13·83	85·3	12·7	11·38	10·25
M. 32/10	12 months	26 July	17·9	15·15	84·6	12·6	12·48	11·17
M. 28/10	12 months	26 July	16·5	13·76	83·3	9·8	11·72	10·29
Q. 116 Sport	12 months	26 July	16·7	13·65	81·7	11·0	11·47	10·01
N.G. 94	14 months	26 July	17·3	13·37	77·2	12·5	11·03	9·24
N.G. 90	14 months	26 July	18·8	16·54	87·9	11·0	13·89	12·76
H.Q. 409	14 months	26 July	18·8	15·95	84·8	12·0	13·22	11·84
N.G. 148	14 months	26 July	16·1	13·59	84·4	11·0	11·41	10·20
N.G. 81	14 months	26 July	16·2	13·14	81·1	11·9	10·92	9·49
N.G. 165	14 months	26 July	17·3	15·32	88·5	9·5	13·10	12·08
Tableland Badila	11½ months	26 July	18·7	16·50	88·23	10·5	13·94	12·83
Tableland Goru	11½ months	26 July	18·7	16·64	88·9	11·0	13·98	12·93
Oba Badila	11½ months	26 July	16·7	14·82	88·7	10·5	12·52	11·56
B. 6450	11½ months	26 July	18·0	17·03	94·6	10·8	14·34	13·76
B. 4030	11½ months	26 July	17·7	15·34	86·66	10·5	12·96	11·79
B. 4596	11½ months	26 July	12·9	8·61	66·7	10·4	5·34	7·28
M.Q. 2	11½ months	26 July	17·5	14·97	85·5	10·3	12·68	11·44
M.Q. 3	11½ months	26 July	17·0	14·27	83·9	9·8	12·16	10·83
M.Q. 4	11½ months	26 July	16·3	12·94	79·3	10·9	10·88	9·31
M.Q. 5	11½ months	26 July	17·0	13·83	81·3	11·9	11·49	10·01
M.Q. 6	11½ months	26 July	15·7	11·75	74·8	11·4	9·82	8·02
M.Q. 7	11½ months	26 July	16·2	13·05	80·5	10·8	10·98	9·49
D. 109	11½ months	26 July	15·6	12·12	77·6	10·9	10·19	8·57

ANALYSIS OF FIRST RATOON VARIETIES—7TH JUNE, 1922.

Name of Variety.	Age.	Date of Analysis.	Brix. of Juice.	% Sugar in Juice.	Quotient.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
Tableland Badila	9 months	7th June	16·0	12·13	75·8	10·0	10·31	8·50
Tableland Goru	9 months	7th June	16·5	13·12	79·5	11·0	11·02	9·44
Tableland Rose Bamboo	9 months	7 June	18·0	15·92	88·4	10·5	13·45	12·39
Tableland S. Singapore	9 months	7 June	18·5	16·31	88·1	10·5	13·78	12·67
Tableland Meera	9 months	7 June	19·8	18·19	91·8	10·8	15·31	14·44
Q. 903	9 months	7 June	16·8	13·35	79·4	10·2	11·32	9·69
Q. 970	9 months	7 June	17·8	15·21	85·4	10·3	12·88	11·61
Q. 1092	9 months	7 June	16·5	11·81	71·5	10·0	10·04	7·87
Q. 1098	9 months	7 June	16·4	12·29	74·9	11·0	10·32	8·43
Q. 1133	9 months	7 June	17·9	14·26	79·6	11·0	11·98	10·28
Q. 1121	9 months	7 June	16·2	10·40	64·19	10·2	8·82	6·20
Q. 855	9 months	7 June	16·2	12·95	79·9	12·0	10·75	9·24
Q. 813	9 months	7 June	18·45	16·36	88·6	11·5	13·66	12·61
Q. 812A	9 months	7 June	20·7	18·88	91·2	11·5	15·76	14·80
Q. 695	9 months	7 June	16·7	12·71	76·1	10·0	10·80	8·94
Shahjahanpur	9 months	7 June	18·7	16·35	87·4	16·1	12·90	11·79
Petite Senneville	9 months	7 June	16·2	12·85	79·3	11·5	10·73	9·17
M. 168[04]	9 months	7 June	17·0	13·68	80·4	11·0	11·49	9·93
M. 89	9 months	7 June	15·0	10·85	72·3	10·0	9·22	7·31
M. 87	9 months	7 June	17·4	13·26	76·2	10·0	11·27	9·34
N.G. 24B	9 months	7 June	16·8	13·21	78·6	11·0	11·10	9·43
N.G. 24A	9 months	7 June	15·9	12·13	76·2	11·0	10·19	8·45
N.G. 24	9 months	7 June	16·6	12·87	77·5	11·0	10·81	9·08
N.G. 16	9 months	7 June	14·2	9·79	68·9	10·0	8·32	6·31
Tableland Badila (duplicate)	9 months	7 June	16·5	12·98	78·6	10·0	11·03	9·37
8 R. 431	9 months	7 June	13·8	9·56	69·2	8·6	8·26	6·30
H.Q. 77	9 months	7 June	16·0	13·40	83·7	10·6	11·30	10·04
7 R. 428	9 months	7 June	15·8	12·33	78·0	9·7	10·52	8·89
H.Q. 426	9 months	7 June	18·5	15·97	86·3	10·0	13·57	12·31
H.Q. 458	9 months	7 June	17·1	14·17	82·8	10·3	12·00	10·59
Hybrid No. 1	9 months	7 June	16·3	13·81	84·1	9·5	11·80	10·57
Badila Seedling	9 months	7 June	15·5	11·51	74·2	9·5	9·84	7·98
H. 227	9 months	7 June	14·4	11·16	77·5	12·7	9·18	7·71
H. 146	9 months	7 June	15·1	12·07	79·9	10·3	10·22	8·79
H. 109	9 months	7 June	16·1	12·50	77·6	10·8	10·52	8·85
J. 247	9 months	7 June	13·0	8·12	62·4	11·1	6·81	4·64
E.K. 1	9 months	7 June	11·0	6·38	58·0	10·2	5·41	3·35
E.K. 2	9 months	7 June	12·4	8·03	64·7	10·7	6·77	4·81
E.K. 28	9 months	7 June	15·5	12·15	78·3	10·3	10·29	8·72
100 Bont	9 months	7 June	13·3	8·35	62·7	12·0	6·93	4·75

ANALYSIS OF FIRST RATOON VARIETIES—7TH AUGUST, 1922.

Name of Variety.	Age.	Date of Analysis.	Brix. of Juice	% Sugar in Juice.	Quotient.	% Fibre.	% Sucrose in Cane.	% C.C.S. in Cane.
Tableland Badila	11 months	7 Aug.	19·0	17·34	91·2	10·0	14·74	13·84
Tableland Goru	11 months	7 Aug.	18·6	16·55	88·9	11·0	13·90	12·86
Tableland Rose Bamboo	11 months	7 Aug.	18·9	17·12	90·9	10·5	14·47	13·52
Tableland Striped Singapore	11 months	7 Aug.	19·6	18·56	94·6	10·5	15·68	15·05
Tableland Meera	11 months	7 Aug.	20·1	18·94	94·2	10·8	15·97	15·30
Q. 1133	11 months	7 Aug.	19·0	16·33	85·9	11·0	13·72	12·41
Q. 1121	11 months	7 Aug.	16·5	13·60	82·5	10·2	11·53	10·14
Q. 1098	11 months	7 Aug.	18·0	15·34	85·1	11·0	12·86	11·55
Q. 1092	11 months	7 Aug.	17·9	14·90	83·2	10·0	12·66	11·21
Q. 970	11 months	7 Aug.	20·0	18·51	92·5	10·3	15·68	14·85
Q. 903	11 months	7 Aug.	18·6	15·67	84·2	10·2	13·29	11·87
Q. 855	11 months	7 Aug.	18·5	16·40	88·6	12·0	13·61	12·56
Q. 813	11 months	7 Aug.	20·7	19·34	93·4	11·5	16·15	15·38
Q. 812A	11 months	7 Aug.	18·9	17·35	91·8	11·5	14·48	13·65
Q. 695	11 months	7 Aug.	17·0	14·12	83·0	10·0	12·00	10·61
Shahjahanpur	11 months	7 Aug.	17·8	15·97	89·7	16·1	12·60	11·70
M. 168[04]	11 months	7 Aug.	15·4	12·26	79·6	11·0	10·30	8·83
Petite Senneville	11 months	7 Aug.	15·1	12·43	82·3	11·5	10·38	9·11
M. 89	11 months	7 Aug.	16·4	12·88	78·5	10·0	10·95	9·28
M. 87	11 months	7 Aug.	18·2	15·12	83·08	10·0	12·85	11·36
N.G. 24B	11 months	7 Aug.	18·1	16·97	93·7	11·0	14·25	13·60
N.G. 24A	11 months	7 Aug.	18·2	15·76	86·6	11·0	13·24	12·04
N.G. 24	11 months	7 Aug.	18·6	16·40	88·1	11·0	13·77	12·66
E.K. 28	11 months	7 Aug.	17·2	14·54	84·5	10·3	12·31	11·01
E.K. 2	11 months	7 Aug.	15·3	12·36	80·7	10·7	10·42	9·03
E.K. 1	11 months	7 Aug.	17·2	14·99	87·1	10·2	12·71	11·60
N.G. 16	11 months	7 Aug.	16·7	13·17	78·8	10·0	11·19	9·53
8 R. 431	11 months	7 Aug.	17·2	14·89	86·57	8·6	12·86	11·69
H.Q. 77	11 months	7 Aug.	18·4	17·05	92·6	10·6	14·39	13·64
7 R. 428	11 months	7 Aug.	17·8	15·15	85·1	9·7	12·92	11·61
H.Q. 426	11 months	7 Aug.	20·6	19·19	93·1	10·0	16·31	15·51
H.Q. 458	11 months	7 Aug.	17·5	15·36	87·7	10·3	13·01	11·93
Hybrid No. 1	11 months	7 Aug.	16·3	14·40	88·3	9·5	12·31	11·34
Badila Seedling	11 months	7 Aug.	19·3	17·47	90·5	9·5	14·93	13·96
H. 227	11 months	7 Aug.	16·6	13·84	83·3	12·7	11·39	10·09
H. 146	11 months	7 Aug.	17·9	16·07	89·7	10·3	13·61	12·66
H. 109	11 months	7 Aug.	18·1	15·95	88·1	10·8	13·43	12·35
J. 247	11 months	7 Aug.	17·2	14·72	85·5	11·1	12·35	11·14
100 Bont	11 months	7 Aug.	17·2	14·54	84·5	12·0	12·06	10·78

The following notes on the varieties at the South Johnstone Sugar Experiment Station have been supplied by the Chemist in Charge:—

Variety Notes—Season 1921-1922.

The variety canes, although giving a return in the vicinity of 32 tons per acre, did not show up so well in densities as in previous seasons. This was due to the check in the growth in March, the resulting early arrowing of canes, and owing to circumstances, the early analyses of the canes.

Of the new canes, the varieties B.6450 and M.55/1182 gave the best yield in weight and sucrose content. The B.6450 is a fine erect cane, heavy and a good stooler. The M.55/1182 is the most promising of all Mauritius canes tried on the station. This cane is inclined to throw spindly stalks, but stools well, arrowed very sparsely, and has a healthy foliage. The other West Indian canes—B.4030, B.4596, and D.109—made good growth, but densities were a little on the low side.

The Mossman seedlings, with the exception of M.Q.5 and M.Q.6, made fair growth. The M.Q.1, although developing peculiar aborted leaves at an early stage of growth, made good headway and yielded stools of good canes. The M.Q.2 has also a promising appearance, the density so far being fair.

The cane H.Q.409 made fair headway, stools well, but lodges considerably, and arrowed 100 per cent.

Of the later New Guinea canes under trial, viz., N.G.165, N.G.94, N.G.103, N.G.148, N.G.90, N.G.102, and N.G.81, these varieties made good growth, but owing to the plant sets arriving in a perishing condition and the limited number of strikes, further experimental trials will be required.

Of the older canes, all the Queensland seedlings gave good returns by weight, the Q.813 and 812A. giving far superior densities, and are early-maturing canes. The Q.1121 made heavy growth but yields low densities.

The Java canes all made good growth. The E.K.28 arrowed early and gave a poor density compared with former crops.

The E.K.1 gave fair ratoons and showed no arrowing. This cane has a poor rooting system, its tillering capacity is good, but care has to be taken in ratooning.

All the Hawaiian canes made good headway. The H.109 gave the most favourable ratoons. The H.146, although of a good rooting system, has a limited tillering capacity, the stools being open, the canes straddling.

Of the other more important canes, H.Q.458 seems to be improving with each planting out. This cane, although limited in stooling capacity, gives heavy stalks of erect habit, and does particularly well on some of the river flats, withstanding flood waters better than Badila.

The cane 7R.428 gave a fair return in first ratoons, arrowed early, and sucrose yield only medium.

Dates of Arrowing of Cane, 1922. Northern Sugar Experiment Station.

Improved Forage	13th May
Q. 116 Sport	13th May
M.Q. 3	15th May
M.Q. 7	15th May
H.Q. 409	15th May
M. 87	16th May
M. 89	16th May
B. 4030	17th May
Q. 1133	17th May
M.Q. 4	18th May
Petite Senneville	18th May
M. 168[04]	18th May
M.Q. 5	19th May
M.Q. 6	19th May
H.Q. 77	19th May
J. 247	20th May
H. 109	20th May
B. 4596	21st May
M.Q. 2	21st May
M. 28/10	21st May
7 R. 428	21st May
Shahjahanpur	21st May
Striped Singapore	21st May
Rose Bamboo	21st May
E.K. 28	26th May
Q. 855	26th May
N.G. 94	28th May
B. 147	28th May
Q. 903	28th May
N.G. 16	29th May
B. 6450	30th May
D. 109	30th May
H.Q. 458	30th May
Q. 695	30th May
Q. 970	30th May
Q. 1092	30th May
Q. 1098	30th May
Q. 1121	30th May
Meera	30th May
N.G. 102	1st June
N.G. 103	1st June
M. 32/10	1st June
N.G. 90	3rd June
E.K. 2	3rd June
H. 146	3rd June
H. 227	3rd June
N.G. 148	4th June
M. 55/11	5th June
N.G. 24	5th June
812 A	5th June
Q. 813	5th June
Tableland Goru	5th June
Hybrid No. 1	10th June
N.G. 24A	10th June
N.G. 24B	10th June
Tableland Badila	10th June
M. 55/1182	26th June
H.Q. 426	26th June

5.—Experiments in Raising Seedling Canes.

It was determined in 1921 to endeavour to raise new seedling canes at the South Johnstone Sugar Experiment Station. Previous attempts that were made at the Mackay Experiment Station over a series of years and at the Kamerunga State Nursery ended in failure. With the favourable environment at South Johnstone, it was considered that success might be obtained. Accordingly, early in 1921, Mr. McWalters was advised by the Director to commence work as soon as the arrows were sufficiently mature. Full instructions were sent, based on the experience of the Colonial Sugar Refining Company, who raised a large number of seedlings at Hambledon many years ago, and who, in 1905, kindly supplied the writer of this report with their methods.

Proper soil and boxes were prepared, and as soon as the arrows became "fluffy" they were sown separately. The chemist in charge supplied the following notes upon the work:—

Due to the early arrowing of canes, a commencement was made in the raising of seedlings in the latter part of June and early in July.

The season was not very favourable for the collection of seed, due to the heavy gales which occurred in June destroying the arrows, and also to the fact that the better class of canes arrowed very sparsely, and in the case of Badila only a few arrows developed in the first ratoon variety plot.

Soil Used for Propagation.—The soil was taken from the scrub, being collected from the base of old bean-tree stumps. After the addition of further organic matter, the soil was sterilised by heat.

The seeds from the following varieties were planted on 27th June:—N.G.16, H.109, Q.903, H.Q.77, E.K.^{28}, Q.695, 812A, N.G.24, and Badila. Germinations took place in four to five days.

The following are the number of seedlings, first stage, obtained:—

	No. of Seedlings
N.G. 16	80
H. 109	63
Q. 903	125
H.Q. 77	250
E.K.^{28}	35
Q. 695	50
N.G. 24	10
812 A.	5
N.G. 15 (Badila)	118

From the above number of 736 seedlings, 260 canes were potted out during the dates from 9th to 26th September, 1921. These were subsequently transferred to the field, where they are at present doing well and should be ready to plant out for providing cane for trials as to their commercial value very soon.

The seedling work was continued during the present year, and Mr. McWalters reports as follows:—

Seedling Work, 1922.

A similar procedure to last year was adopted in the raising of seedlings. The arrowing period was approximately a fortnight later than the previous year.

Seed from selected canes was planted in the latter part of June, but germination was very backward.

Seedlings from the following canes were obtained and are being planted out to second stage:—

	Seedlings.
N.G. 94	22
N.G. 102	110
Q. 903	19
Q. 855	80
H.Q. 77	6
7 R. 428	9
Total	246

Although the Badila arrowed, the inflorescence failed to unfold, and no seed was obtained for planting from this variety during the current season.

The 1921 seedlings on the nursery are progressing favourably. Of the total number of 290 seedlings, approximately 160 are advanced in growth, showing fair stools, and some of the seedlings have 2 to 3 feet of developed cane.

Canes Introduced, 1922.

From the Mackay Experiment Station—Gingor, a cross between N.G.24A. or Striped Goru and Mauritius Gingham, raised by Mr. Crofton, of Ayr.

From the Kairi State Farm—A further shipment of Tableland Badila.

Distribution of Varieties, 1922.

The distribution of canes was advertised for the 1st August, and deliveries were made up to the 17th of the month. About twenty local farmers visited the station and received canes during the first week in August. A large number of applications were received from the district, and the canes were forwarded. A good number of applications received from Cairns and other districts arrived too late, as all the varieties were harvested and sent to the mill between dates 17th to 20th August.

The following were the amounts of cane distributed:—

Lower Burdekin Experiment Plot	1 crate
To Mossman Mill	1 crate
To Farmer's League, Ingham	1 crate
To Halifax Planters' Club	1 crate
To Cairns district	47 bags
To Johnstone and Innisfail	151 bags
Parcels forwarded	18

The following in order were the chief canes applied for:—Tableland Badila, Oba Badila, H.Q.458, Tableland Goru, Q.813, Q.903, Badila Seedling, H.146.

Smaller quantities of the following were sought after, viz.:—H.109, E.K.1, E.K.28, Hybrid No. 1, 7 R.428, H.Q.426, N.G.16, Q.970, Q.1098, Q.855, and M.Q.1.

Total Tonnage of Cane Harvested from the Sugar Experiment Station at South Johnstone during 1922:—

	Tons.
Cane sent to mill	427·425
Cane used for planting	10·880
Cane distributed	11·000
Total	449·305

Condition of Crop—

54·1 per cent.	Second ratoons
37·9 per cent.	First ratoons
8·0 per cent.	Plant cane
Badila, 1st ratoon	76·96 tons cane
Badila, 2nd ratoon	217·71 „
Variety plant	37·02 „
Variety, 1st ratoon	117·61 „

Return per acre—

Badila, 1st ratoon	40·3 tons
Badila, 2nd ratoon	27·87 „
Variety plant	32·2 „
Variety, 1st ratoon	32·9 „
Acreage under cane	14·44
Average tons cane per acre	31·11

The above result is most satisfactory, considering that more than one-half the area was under second ratoons and that only 8 per cent. was plant cane.

New Experiments.

(1) Liming and fertilising experiment plots will be treated as follow:—

Plot 1	Will receive 1 ton of Lime per acre.
Plot 2	Will receive 1 ton of Lime per acre and mixed manures.
Plot 3	No lime, no manures.
Plot 4	Will receive Basic Superphosphate only.
Plot 5	Will receive Basic Superphosphate, Nitrogen, and Potash.

The above are intended to test the action of lime, mixed manures, and basic superphosphate.

(2) Trials with green manure.

5.—WORK OF THE CENTRAL SUGAR EXPERIMENT STATION AT MACKAY.

The Central Sugar Experiment Station at Mackay is under the care of Mr. F. Keogh, the chemist in charge. Mr. Keogh has carefully carried out the instructions of the Director, and his work has been performed with zeal and efficiency. During the preparation of the final chemical figures in connection with this portion of the report, Mr. Keogh was assisted by Mr. C. R. Von Stieglitz, whose work was accurately and carefully done.

Weather Notes Covering Period from March, 1921, to end of September, 1922.

The weather during the early part of 1921 was favourable for the preparation of land for planting, the rainfall was good, as during March 26·31 inches were recorded, and there were also good rains in January and February. The month of March was too wet for much planting to be done, and most of the early planting was done from the beginning of April onwards. Cane planted on the station early in April struck very well and made vigorous growth; the weather at the time was favourable, and no cold weather was experienced during the early winter months. Most farmers were busy planting right up to the end of June, and in most cases good strikes resulted, as the weather was mild. The month of April was showery—thirteen wet days for 276 points of rain. In May, also, the weather was mild and showery—twelve wet days for 176 points. This showery and mild weather kept the young cane growing well, and similar conditions were experienced till the end of June, as in this month there were thirteen wet days and 290 points of rain; so the cane still made good progress in both the young plant and older crops. On the last day of June a very heavy fall of rain was experienced, with a strong wind, and in some cases where farmers had just planted, the cane sets were washed out of the drills, necessitating replanting, and in other cases the soil set after the heavy downpour and retarded the young shoots from coming through.

The month of July was mild, with a few light falls of rain, the cane still making fair growth. Towards the end of July—the last few days in particular—the weather became colder, and in the first week in August frosts were experienced on five mornings. From then till the end of August the weather was fairly mild again, and no further frosts were experienced. The month of August was dry, but there was plenty of moisture in the soil, and most plantings struck well. In September the weather was very favourable with good rains—802 points on fifteen wet days. This fall was much above the average—214 points for the past twenty-one years. September is usually a dry month, and rain about this time is very acceptable to the young cane, as the remainder of the year is usually dry.

During October and November the cane kept growing well, and falls of rain a little below the average were recorded. In December good rains were again experienced, the registration being 1,450 points. This is considerably above the average, and up to the end of this month the cane had made very good growth, having ample moisture right from the time it was planted and no check in growth.

The average rainfall in January for the past twenty-one years, as recorded at this station, was 1,868 points, but January, 1922, was considerably below the average—only 371 points fell, and most of this was experienced early in the month, on the 8th. From this date till the end of the month only a few light showers fell; and although the weather was warm, the cane did not make its usual growth.

Of the February rain the greater portion fell on the first five days of the month, the remainder of the month being practically dry. The cane at this time was in a fairly advanced stage of growth, but from then onwards very little growth took place, as the remaining months were very dry.

March, with 159 points, and April with 215, usually two good growing months, were very disappointing, and the falls of rain were all in very light showers on a large number of wet days. These falls were practically of no value, as they did not soak into the soil at all, only damping the surface and being being lost again by evaporation. The same conditions were experienced in May—no rainfall of any benefit, and at this time the hopes of a good crop were very poor. Reviewing the rainfall from the 6th of February till the end of May, a period of twelve weeks, the total fall of rain was 651 points, and as the greater amount of this only fell in light showers, the whole of this good-growing period was of little value to the growth of cane. Following on this the month of June was very dry—91 points on eight wet days. In some parts of the district, owing to the prolonged dry spell, the cane was very yellow in the leaves, and in some cases almost dead, and grubs were telling on the cane. The cane was dying from the top downwards, and a large percentage of the sticks, when broken or cut, were pithy inside and had very little juice.

During July good rains fell, totalling 437 points, and this to a great extent saved the cane that was dying, producing a fairly green and healthy appearance, and greatly improved the sugar content of what would have been very poor cane. This rain also improved the growth of other cane a little, but was too late in the year to have any marked effect. From the end of July to the end of September was very dry, and although the tonnage per acre of cane was low, this was compensated for in some respect by the high sugar content. The average tonnage of cane per acre on the station was about 21, compared with 32 last year.

ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE AT THE SUGAR EXPERIMENT STATION, MACKAY, FROM 1ST SEPTEMBER, 1921 TO 31ST AUGUST, 1922—COVERING GROWTH OF EXPERIMENT CROPS.

Month.	Rainfall in Inches.	Number of Wet Days.	Average Rainfall, 21 Years, 1901–1921.	Highest Shade Maximum.	Lowest Shade Maximum.	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.	Lowest Terrestial Min.*	Mean Terrestial Min.	Mean Diurnal Range.	Mean Temperature, 9 a.m.	Mean Relative Humidity of the Air, Saturation equalling 100 at 9 a.m.	Mean Daily Evaporation in Inches.
Sep., 1921 ..	8·02	15	2·14	90·0	71·7	78·8	68·1	51·8	61·3	45·2	56·8	17·5	71·9	78·0	·17
Oct., 1921 ..	1·60	9	2·19	95·0	77·1	84·0	70·3	51·9	61·5	45·2	57·2	22·5	76·7	77·0	·246
Nov., 1921 ..	1·32	6	3·07	90·8	83·8	86·6	72·3	54·9	65·2	51·8	62·0	21·4	81·6	66·7	·30
Dec., 1921 ..	14·50	15	7·39	100·5	81·8	89·2	76·8	61·4	70·2	58·2	67·3	19·0	83·6	69·5	·23
Jan., 1922 ..	3·71	9	18·68	100·1	83·2	91·2	76·2	65·4	71·6	62·2	69·1	19·6	83·9	73·0	·23
Feb., 1922 ..	10·78	17	8·87	94·8	80·2	87·7	76·5	65·8	72·2	62·2	69·4	15·5	79·9	80·0	·176
Mar., 1922 ..	1·59	11	10·81	91·4	79·2	87·0	77·2	58·7	66·9	56·2	64·4	20·1	78·9	77·2	·26
Apr., 1922 ..	2·15	15	6·40	90·0	83·1	85·7	72·0	58·8	65·7	56·9	63·4	20·0	78·8	76·8	·23
May, 1922 ..	1·42	7	3·78	86·5	72·8	80·5	73·0	44·3	57·0	40·4	54·1	23·5	70·5	70·5	·25
June, 1922 ..	·91	8	2·64	83·2	62·1	77·4	65·8	41·8	53·1	38·6	50·5	24·3	66·6	76·5	·19
July, 1922 ..	4·37	12	1·44	79·2	56·9	72·3	61·4	39·1	50·3	32·3	46·0	22·0	62·2	76·0	·19
Aug., 1922 ..	·05	1	1·13	84·2	72·8	77·8	59·0	39·0	47·3	32·9	42·0	30·5	65·8	65·5	·23
Total ..	50·42	125	68·54	..	..	..	..	..	..	..	..	..	..	73·9*	..

* Average.

The columns showing the number of wet days during the growing season and the average monthly rainfalls for the past twenty-one years form an interesting addition to the above table. This will enable the reader in future to compare the rainfalls in any given month with the average rainfall for the same month over a long period.

The lowest terrestrial or grass minimum recorded was 32·3 in the month of July. The average relative humidity for the twelve months at 9 a.m. was 73·9, as against 75·9 last season.

The temperature readings are also of importance from the manner in which they are shown. Hilgard ("Soils," page 289) points out that it is the extremes of temperature that are most important, and that the annual mean temperature is not a good criterion, since one and the same figures may result equally from the averaging of two widely divergent data and from such as are close together. Thus an average of 60 degrees Fahr. might result equally from the averaging of 65 and 55 degrees, or from taking the mean of 15 and 105 degrees, yet the respective cultural adaptations would be widely different.

EXPERIMENTS DEALT WITH IN THE FOLLOWING SECTION.

1. Further experiments in deep ploughing and subsoiling *versus* ordinary cultivation. Variety used, Green Goru (N.G.24B.), second ratoons.

2. Experiments with varieties of cane from different countries to test their commercial value.

3. Trials with muriate and sulphate of potash. Experiments testing the action of muriate of potash *versus* sulphate of potash on cane juices. In the application of these fertilisers the same amount of potash will be used in both salts. A similar experiment is being carried out at Bundaberg.

4. Competitive trials of the following varieties:—H.227, H.146, H.109, Java 100 Bont, Java 247, Java E.K.^{1}, E.K.^{2}, E.K.^{28}, M.168^{04}, H.Q.77, Shahjahanpur No. 10 and N.G.24B, and Q.813 for comparison.

1.—FURTHER EXPERIMENTS IN SUBSOILING VERSUS ORDINARY CULTIVATION, PLANT CROP. VARIETY USED, GREEN GORU (N.G.24B.).

Due to the cyclonic damage to the plant crop of the previous experiment with subsoiling in 1918, it was determined to repeat the trial. Accordingly, uniform land was divided into two pieces, the whole being cross-ploughed four times to 12 inches, while one-half received a subsoiling with the special implement known as the subsoiler to a further depth of 7 inches, making 19 inches in all. The other treatment of the whole of the land was identical. The cane used for plants was Green Goru or N.G.24B. This crop was planted in April of 1919, and the difference between the subsoiled and unsubsoiled plots was well marked during the whole period of growth in the plant crop, and also in the first and second ratoons.

The analytical and crop results are furnished hereunder:—

ANALYTICAL RESULTS OF SUBSOILING EXPERIMENTS—SECOND RATOON CROP, SEPTEMBER, 1922. VARIETY, GREEN GORU (N.G. 24B).

Plot.	Treatment.	Date of Analysis.	Age of Cane.	% Total Solids (Brix)	% Sucrose in Juice.	% Glucose in Juice.	C.C.S. in Cane.	Purity of Juice.	Fibre in Cane.
1	Plant crop subsoiled and ratoon crops also subsoiled	13-9-22	11 months	20·4	19·26	·34	15·50	94·4	11·0
2	Plant crop not subsoiled, and present crop ratooned by ploughing 9 inches deep	13-9-22	11 months	21·4	19·92	·25	15·61	93·0	12·4

Crop Results of Subsoiling Experiments—Second Ratoon Crop—September, 1922. Variety, Green Goru (N.G. 24B).

Plot.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Plant crop subsoiled and ratoon crops also subsoiled	11 months	27·7	4·29
2	Plant crop not subsoiled, and present crop ratooned by ploughing 9 inches deep	11 months	22·1	3·45

The yield of cane for subsoiling in the second ratoons amounts to 27·7 tons of cane per acre, while the plot which was not subsoiled produced 22·1 tons. This shows an increase of 5·6 tons of cane per acre. The increased yield of sugar per acre due to the subsoiling amounted to ·84 tons. These figures are almost identical with those recorded for the first ratoon crops last year. They confirm previous experiments, and prove the great advantage to be secured by subsoiling on alluvial lands with clayey subsoils. The subsoiling, however, must be properly done, and in such a way that the land lying below the ordinary depth reached by the plough is only stirred—not turned over and brought to the top. Due to the large amount of working that the ordinary or farmer's plot received, the results for this are also good. In ordinary practice, it is doubtful if all farmers cross-plough four times to 12 inches deep and thoroughly ratoon to 9 inches.

Below are given the analytical and crop results of this experiment to date:—

Analytical Results to Date of Subsoiling Experiments—Plant, First Ratoon, and Second Ratoon Crops 1920, 1921, and 1922. Variety Used, Green Goru (N.G. 24B).

Plot.	Treatment.	Plant Crop—% C.C.S. in Cane.	First Ratoon—% C.C.S. in Cane.	Second Ratoon—% C.C.S. in Cane.	Average of Three Crops.
1	Plant crop subsoiled and ratoon crops also subsoiled ..	13·88	14·96	15·50	14·78
2	Plant crop not subsoiled, and present crop ratooned by ploughing 9 inches deep	13·51	15·0	15·61	14·71

Crop Results to Date of Subsoiling Experiments—Plant, First Ratoon, and Second Ratoon Crops. Variety Green Goru (N.G. 24B).

Plot.	Treatment.	Plant Crop, 1920.			First Ratoon Crop, 1921.			Second Ratoon Crop, 1922.		
		Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.
1	Plant crop subsoiled and succeeding ratoon crops also subsoiled	17 mos.	37·1	5·15	12 mos.	35·8	5·35	11 mos.	27·7	4·29
2	Plant crop not subsoiled, and succeeding crops ratooned by ploughing 9 inches deep	17 mos.	28·5	3·85	12 mos.	29·9	4·48	11 mos.	22·1	3·45

Total yield of cane from subsoiled plot—3 crops	100·6 tons
Total yield of cane from unsubsoiled plot—3 crops	80·5 ,,
Difference in favour of subsoiling	20·1 tons
Total yield of commercial cane sugar from subsoiled plot—3 crops	14·79 tons
Total yield of commercial cane sugar from unsubsoiled plot—3 crops ..	11·78 ,,
Difference in favour of subsoiling	3·01 tons

2.—Experiments with Varieties of Cane from Different Countries to Test their Commercial Value.

In these experiments after harvesting the plant crop last year, the land was ploughed and subsoiled to a depth of about 15 inches between the drills and then harrowed down. At the time of ratooning at the end of October the moisture in the soil was good, and all the canes came away well. One cane, Barbados 4030, was ploughed out owing to its being badly affected with disease. The ratoons made good growth until the end of January, 1922, but from then onwards the growth was slow, owing to the poor rainfall. Some of the canes are rather poor. 8 R.431, a Fijian cane, has a good c.c.s. content, but its growth is remarkably slow, both the plant and first ratoon crops cutting very low tonnages. Barbados 6450 gave a fair tonnage

in the plant crop, but it is a very sparse stooler, and the first ratoon crop is of rather low tonnage per acre. The commercial cane sugar content is fairly good and it matures early. Barbados 4596 has cropped well in both plant and first ratoon; it stools well, but is of low c.c.s. Demerara 109, a thin cane, is not very promising either. The tonnages in both crops are very fair. The latter cane is only of medium sugar content, and is rather hard and slow to cut. Of the Queensland seedlings, Q.903 is somewhat disappointing, and it has not cropped as well as in previous trials. Q.970 has not ratooned well. In previous trials on this station results were much more favourable. Of the remaining Queensland seedlings, Q.813 is the best; it is an excellent striker, ratoons well, and the crops to date in this trial are very satisfactory. It still maintains a high c.c.s. and matures early. It can be safely cut for the mill in most instances as early as July. H.Q.458, Q.1098, and Q.1121 are also good canes, the tonnage and sugar content being fairly good. The former cane has improved in the last few years, both in crop and c.c.s. It is a light stooler, but the sticks are stout and long and easy to cut. It is a good handling cane. Q.1098 is slow at striking, and for this reason is not sought after much by farmers. It germinates well, and the weights of cane and sugar per acre are not much below Q.813. Q.1121 is also fairly good; it is a stout cane, crops well, but is a late maturer and should not be harvested in the early part of the crushing. Of the new canes under trial in this experiment, a few are promising. 7 R.428 (Pompey), a Fijian cane, has produced a higher return of sugar per acre than Q.813 in both the plant and first ratoon crops. In both years it yielded a higher tonnage of cane per acre, but the c.c.s. is lower than Q.813. However, the extra tonnage more than compensates for the lower sugar content. It is a good striker and stools well, both in plant and ratoons. It is good cane to handle and cut. The c.c.s. content is rather low in June, July, and August, but much better by the middle of September, and if left later it is possible it may still increase. It should not be cut for the mill earlier than September.

D.1457 (called Penny's cane) is a fairly good cane, the tonnages per acre giving very fair results. It contains a high percentage of sugar and matures early. The sticks are stout and fairly soft, the fibre being low, and would not be satisfactory to plant where borer is prevalent, as cases have come under notice where it has been badly attacked by the beetle borer.

"Gingor," a cross between Mauritius Gingham and N.G.24 A., has given good results to date. The yield of cane and c.c.s. content are both good, being slightly below Q.813 and 7 R.428 (Pompey) in tons of sugar per acre. M.Q. No. 1, a seedling introduced from Mossman, is much like Badila in habit and growth. It has yielded very fair tonnages and the c.c.s is good.

The following are the analytical and crop results:—

First Preliminary Examination in Experiments with Varieties of Cane from Different Countries—First Ratoon Crop, 1922—June.

Country.	Name or Number of Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.
Demerara	D. 1457	6–6–22	8 months	20·0	17·27	13·16	86·3
Queensland	M.Q. No. 1	6–6–22	8 months	20·3	17·82	13·72	87·7
Fiji	8 R. 431	6–6–22	8 months	20·3	18·49	14·57	91·0
Demerara	D. 109	6–6–22	8 months	14·8	10·29	6·60	69·5
Barbadoes	B. 4596	6–6–22	8 months	14·1	8·77	4·98	62·2
Barbadoes	B. 6450	6–6–22	8 months	18·4	16·74	13·18	90·9
Queensland	Gingor	6–6–22	8 months	17·4	13·50	9·52	77·6
Fiji	7 R. 428	6–6–22	8 months	17·0	13·37	9·54	78·2
Queensland	H.Q. 458	6–6–22	8 months	17·9	14·73	10·86	82·3
Queensland	Q. 813	6–6–22	8 months	19·1	16·79	12·94	87·9
Queensland	Q. 903	6–6–22	8 months	18·1	14·67	10·70	81·0
Queensland	Q. 1098	6–6–22	8 months	17·8	14·73	10·91	82·7
Queensland	Q. 1121	6–6–22	8 months	17·3	14·38	10·68	83·1
Queensland	Q. 970	6–6–22	8 months	18·70	15·65	11·67	83·3

Second Progressive Examination in Experiments with Varieties of Cane from Different Countries—First Ratoon Crop, 1922—July.

Country.	Name or Number of Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.
Demerara	D. 1457	5–7–22	9 months	20·6	19·06	15·16	92·5
Queensland	M.Q. No. 1	5–7–22	9 months	21·0	18·17	13·86	86·5
Fiji	8 R. 431	5–7–22	9 months	21·9	20·74	16·71	94·7
Demerara	D. 109	5–7–22	9 months	19·6	16·24	12·03	82·8
Barbadoes	B. 4596	5–7–22	9 months	18·1	14·75	10·80	81·4
Barbadoes	B. 6450	5–7–22	9 months	19·7	18·30	14·59	92·9
Queensland	Gingor	5–7–22	9 months	19·9	17·27	13·20	86·8
Fiji	7 R. 428	5–7–22	9 months	18·7	15·43	11·40	82·5
Queensland	H.Q. 458	7–5–22	9 months	19·6	16·72	12·64	85·3
Queensland	Q. 813	5–7–22	9 months	20·6	18·45	14·39	89·5
Queensland	Q. 903	5–7–22	9 months	20·0	18·06	14·16	90·3
Queensland	Q. 1098	5–7–22	9 months	20·1	17·88	13·89	88·9
Queensland	Q. 1121	5–7–22	9 months	20·4	19·08	15·27	93·5
Queensland	Q. 970	5–7–22	9 months	20·6	19·06	15·16	92·5

THIRD PROGRESSIVE EXAMINATION IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES—FIRST RATOON CROP, 1922—AUGUST.

Country.	Name or Number of Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.
Demerara	D. 1457	1–8–22	10 months	21·9	21·17	17·21	96·6
Queensland	M.Q. No. 1	1–8–22	10 months	21·2	20·16	16·29	95·1
Fiji	8 R. 431	1–8–22	10 months	21·6	20·79	16·91	96·2
Demerara	D. 109	1–8–22	10 months	17·1	14·57	11·00	85·2
Barbadoes	B. 4596	1–8–22	10 months	17·6	15·81	12·35	89·8
Barbadoes	B. 6450	1–8–22	10 months	20·1	19·32	15·76	96·1
Queensland	Gingor	1–8–22	10 months	20·9	19·89	16·07	95·1
Fiji	7 R. 428	1–8–22	10 months	17·5	15·95	12·57	91·1
Queensland	H.Q. 458	1–8–22	10 months	19·8	18·40	14·62	92·9
Queensland	Q. 813	1–8–22	10 months	21·8	20·61	16·59	94·5
Queensland	Q. 903	1–8–22	10 months	20·0	18·80	15·09	94·0
Queensland	Q. 1098	1–8–22	10 months	20·1	18·98	15·27	94·4
Queensland	Q. 1121	1–8–22	10 months	18·9	18·0	14·51	95·2
Queensland	Q. 970	1–8–22	10 months	20·6	19·20	15·33	93·2

FINAL EXAMINATION IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES—FIRST RATOON CROP, 1922 SEPTEMBER.

Country.	Name or Number of Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	% C.C.S. in Cane.	Purity of Juice.	% Fibre in Cane.
Demerara	D. 1457	13–9–22	11½ months	21·2	20·01	·26	16·48	94·4	8·8
Queensland	M.Q. No 1	13–9–22	11½ months	22·0	20·85	·18	16·81	94·7	11·2
Fiji	8 R. 431	13–9–22	11½ months	21·9	20·96	·26	16·99	95·7	11·0
Demerara	D. 109	13–9–22	11½ months	19·2	18·11	·24	14·47	94·3	11·4
Barbadoes	B. 4596	13–9–22	11½ months	17·5	16·19	·54	12·49	92·5	13·5
Barbadoes	B. 6450	13–9–22	11½ months	20·4	19·63	·15	15·58	96·2	12·8
Queensland	Gingor	13–9–22	11½ months	20·3	19·36	·23	15·76	95·3	10·7
Fiji	7 R. 428	13–9–22	11½ months	20·2	18·62	·43	14·60	92·2	11·8
Queensland	H.Q. 458	13–9–22	11½ months	19·9	18·59	·49	15·13	93·4	9·5
Queensland	Q. 813	13–9–22	11½ months	21·8	21·1	·18	17·10	96·8	12·1
Queensland	Q. 903	13–9–22	11½ months	20·5	19·74	·23	15·67	96·3	12·9
Queensland	Q. 1098	13–9–22	11½ months	20·6	19·59	·42	15·54	95·1	12·4
Queensland	Q. 1121	13–9–22	11½ months	20·7	20·03	·15	15·94	96·7	13·1
Queensland	Q. 970	13–9–22	11½ months	21·3	20·41	·25	16·26	96·1	12·5

From a study of the above tables giving the analyses in detail from June to September, the early and late maturing canes can be ascertained, and by reference to the crop results as tabulated below the respective merits of the different varieties can be judged. The following mixture of manures was applied early in November at the rate of 650 lb. per acre.

Sulphate of Ammonia	100 lb.
Nitrate of Soda	150 lb.
Muriate of Potash	100 lb.
Superphosphate	300 lb.
	650 lb.

In December the following additional application of nitrogenous manures was made as a top-dressing :—75 lb. sulphate of ammonia and 40 lb. nitrate of soda per acre.

CROP RESULTS IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES—1ST RATOON CROP, 1922.

Country.	Name or Number of Variety.	First Ratoon.		
		Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
Demerara	D. 1457	11½ months	26·3	4·33
Queensland	M.Q. No. 1	11½ months	21·2	3·56
Fiji	8 R. 431	11½ months	8·2	1·39
Demerara	D. 109	11½ months	28·8	4·16
Barbadoes	B. 4596	11½ months	27·8	3·47
Barbadoes	B. 6450	11½ months	22·5	3·50
Queensland	Gingor	11½ months	28·7	4·52
Fiji	7 R. 428 (Pompey)	11½ months	35·5	5·18
Queensland	H.Q. 458	11½ months	28·2	4·26
Queensland	Q. 813	11½ months	29·5	5·01
Queensland	Q. 903	11½ months	18·6	2·91
Queensland	Q. 1098	11½ months	27·1	4·21
Queensland	Q. 1121	11½ months	27·6	4·40
Queensland	Q. 970	11½ months	24·9	4·05

Hereunder are appended the analytical and crop results of this experiment to date:—

ANALYTICAL RESULTS TO DATE IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES. PLANT AND FIRST RATOON CROPS.

Country.	Name or Number of Variety.	Plant Crop—% C.C.S. in Cane.	First Ratoon Crop—% C.C.S. in Cane.	Average C.C.S. for Two Crops.
Demerara	D. 1457	15·56	16·48	16·02
Queensland	M.Q. No. 1	15·98	16·81	16·39
Fiji	8 R. 431	15·90	16·99	16·44
Demerara	D. 109	13·96	14·47	14·22
Barbadoes	B. 4596	12·11	12·49	12·30
Barbadoes	B. 6450	15·27	15·58	15·43
Queensland	Gingor	15·08	15·76	15·42
Fiji	7 R. 428 (Pompey)	14·99	14·60	14·80
Queensland	H.Q. 458	14·74	15·13	14·94
Queensland	Q. 813	15·15	17·10	16·13
Queensland	Q. 903	13·63	15·67	14·65
Queensland	Q. 1098	14·06	15·54	14·80
Queensland	Q. 1121	12·97	15·94	14·46
Queensland	Q. 970	14·69	16·26	15·48

CROP RESULTS TO DATE IN EXPERIMENTS WITH VARIETIES OF CANE FROM DIFFERENT COUNTRIES.

Country.	Name or No. of Variety.	Plant Crop, 1921.		1st Ratoon Crop, 1922.		Total for Two Years.	
		Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
Demerara	D. 1457	39·3	6·11	26·3	4·33	65·6	10·44
Queensland	M.Q. No. 1	35·9	5·74	21·2	3·56	57·1	9·30
Fiji	8 R. 431	22·9	3·64	8·2	1·39	31·1	5·03
Demerara	D. 109	39·3	5·48	28·8	4·16	68·1	9·64
Barbadoes	B. 4596	44·9	5·44	27·8	3·47	72·7	8·91
Barbadoes	B. 6450	32·7	4·99	22·5	3·50	55·2	8·49
Queensland	Gingor	43·4	6·54	28·7	4·52	72·1	11·06
Fiji	7 R. 428 (Pompey)	45·5	6·82	35·5	5·18	81·0	12·0
Queensland	H.Q. 458	42·8	6·31	28·2	4·26	71·0	10·57
Queensland	Q. 813	44·0	6·66	29·5	5·01	73·5	11·67
Queensland	Q. 903	35·9	4·89	18·6	2·91	54·5	7·80
Queensland	Q. 1098	44·3	6·23	27·1	4·21	71·4	10·44
Queensland	Q. 1121	44·9	5·82	27·6	4·40	72·5	10·22
Queensland	Q. 970	38·3	5·63	24·9	4·05	63·2	9·68

3.—TRIALS WITH MURIATE AND SULPHATE OF POTASH. EXPERIMENTS TESTING THE ACTION OF MURIATE OF POTASH VERSUS SULPHATE OF POTASH ON CANE JUICES. IN THE APPLICATION OF THESE FERTILISERS THE SAME AMOUNT OF POTASH WAS USED IN BOTH SALTS.

The object of the above experiments is to ascertain whether muriate of potash has any prejudicial effect upon the cane juice, as is often maintained.

For the purpose of the experiment, the division was divided into eight plots of five drills. The manure was applied at the rate per acre as shown in the table, with two plots left unmanured. No other manures were applied; only sulphate and muriate of potash were used. On the plant crop the muriate of potash gave slightly better results than the sulphate; and where only 1 cwt. of potash was applied per acre, the highest purity and c.c.s. results were obtained. Where the dressings were heavier, at the rate of 2 and 3 cwt. of potash per acre, the purity and c.c.s. contents were lower—even lower than where no manure was used. For the final analyses, 20 running feet of cane were cut from each plot, the weight of cane for each sample being about 2 cwt.

The following are the results of the chemical analyses of the first ratoon crop. As the experiment was merely a chemical one with relation to the action on the cane juices, the crop weights were not recorded:—

FIRST PRELIMINARY EXAMINATION IN EXPERIMENTS TO TEST THE ACTION OF MURIATE OF POTASH, IN COMPARISON WITH SULPHATE OF POTASH AND NO POTASH, UPON CANE JUICES. FIRST RATOON CROP, 1922. JUNE. VARIETY USED Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.	Rate of Application per Acre.
Q. 970	8–6–22	8 months ..	18·9	16·89	13·15	89·3	282 lb. muriate of potash
Q. 970	8–6–22	8 months ..	19·0	16·86	13·07	88·7	188 lb. muriate of potash
Q. 970	8–6–22	8 months ..	19·9	17·82	13·89	94·5	94 lb. muriate of potash
Q. 970	8–6–22	8 months ..	18·1	15·50	11·75	85·6	No manure
Q. 970	8–6–22	8 months ..	18·5	15·92	12·10	86·0	No manure
Q. 970	8–6–22	8 months ..	18·5	15·95	12·14	86·2	100 lb. sulphate of potash
Q. 970	8–6–22	8 months ..	18·9	16·76	12·99	88·6	200 lb. sulphate of potash
Q. 970	8–6–22	8 months ..	18·9	16·28	12·38	86·1	300 lb. sulphate of potash

SECOND PROGRESSIVE EXAMINATION IN EXPERIMENTS TO TEST THE ACTION OF MURIATE OF POTASH IN COMPARISON WITH SULPHATE OF POTASH AND NO POTASH, UPON CANE JUICES. FIRST RATOON CROP, 1922, JULY. VARIETY USED, Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	% Purity of Juice.	Rate of Application per Acre.
Q. 970	6–7–22	9 months ..	20·2	18·35	14·43	90·8	282 lb. muriate of potash
Q. 970	6–7–22	9 months ..	20·7	19·0	15·04	91·8	188 lb. muriate of potash
Q. 970	6–7–22	9 months ..	21·1	19·52	15·52	92·5	94 lb. muriate of potash
Q. 970	6–7–22	9 months ..	21·2	19·57	15·54	92·3	No manure
Q. 970	6–7–22	9 months ..	20·3	18·50	14·58	91·1	No manure
Q. 970	6–7–22	9 months ..	20·3	18·53	14·61	91·2	100 lb. sulphate of potash
Q. 970	6–7–22	9 months ..	20·3	18·55	14·64	91·3	200 lb. sulphate of potash
Q. 970	6–7–22	9 months ..	20·3	18·40	14·45	90·6	300 lb. sulphate of potash

THIRD PROGRESSIVE EXAMINATION IN EXPERIMENTS TO TEST THE ACTION OF MURIATE OF POTASH IN COMPARISON WITH SULPHATE OF POTASH AND NO POTASH, UPON CANE JUICES. FIRST RATOON CROP, 1922, AUGUST. VARIETY USED, Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	% Purity of Juice.	Rate of Application per Acre.
Q. 970	3–8–22	10 months	21·2	19·97	16·05	94·2	282 lb. muriate of potash
Q. 970	3–8–22	10 months	21·2	20·08	16·18	94·7	188 lb. muriate of potash
Q. 970	3–8–22	10 months	21·6	20·56	16·62	95·2	94 lb. muriate of potash
Q. 970	3–8–22	10 months	20·8	19·15	15·18	92·1	No manure
Q. 970	3–8–22	10 months	21·1	19·73	15·79	93·5	No manure
Q. 970	3–8–22	10 months	21·5	19·44	15·25	90·4	100 lb. sulphate of potash
Q. 970	3–8–22	10 months	21·3	19·66	15·61	92·3	200 lb. sulphate of potash
Q. 970	3–8–22	10 months	21·8	20·09	15·94	92·1	300 lb. sulphate of potash

FINAL EXAMINATION IN EXPERIMENTS TO TEST THE ACTION OF MURIATE OF POTASH IN COMPARISON WITH SULPHATE OF POTASH AND NO POTASH, UPON CANE JUICES. FIRST RATOON CROP, 1922, SEPTEMBER. VARIETY USED, Q. 970.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	% C.C.S. in Cane.	% Purity of Juice.	% Fibre in Cane.	Rate of Application per Acre.
Q. 970	9–9–22	11 months	21·9	20·26	·26	15·72	92·5	12·7	282 lb. muriate of potash
Q. 970	9–9–22	11 months	21·6	20·23	·29	15·81	93·6	13·4	188 lb. muriate of potash
Q. 970	9–9–22	11 months	21·6	20·42	·22	16·04	94·5	13·5	94 lb. muriate of potash
Q. 970	9–9–22	11 months	21·2	19·99	·31	15·68	94·3	13·9	No manure
Q. 970	9–9–22	11 months	21·7	20·50	·27	16·10	94·5	14·7	No manure
Q. 970	9–9–22	11 months	21·6	20·56	·28	16·22	95·1	12·8	100 lb. sulphate of potash
Q. 970	9–9–22	11 months	21·5	20·53	·28	16·22	95·4	12·7	200 lb. sulphate of potash
Q. 970	9–9–22	11 months	21·9	20·61	·29	16·15	94·1	13·7	300 lb. sulphate of potash

In the first preliminary and second and third progressive analyses, the results were in favour of the muriate of potash again, though the difference in the purity mentioned as occurring in the plant crop did not appear this season. In the final analyses made in September the results are in favour of the sulphate of potash, but it will be wise to await next season's analyses before drawing conclusions. It appears so far that no prejudicial effects can be seen from the use of the muriate of potash.

4.—COMPETITIVE TRIALS OF THE FOLLOWING VARIETIES, VIZ.:—

H.227, H.146, H.109, Java 100 Bont, Java 247, Java E.K.^{1}, E.K.^{2}, E.K.^{28}, M. 168^{04}, H.Q. 77, Shahjahanpur No. 10; and N.G. 24B, and Q. 813 for comparison.

The canes in this experiment include five Java varieties, three from the Hawaiian Islands, one from Mauritius, a Hambledon (Queensland) seedling, and the Indian frost-resisting cane Shahjahanpur, in competition with Q.813 and N.G.24B, Green Goru. The canes were planted on the 1st April, the soil at the time being in very fine order, with a good moisture content. The land was first ploughed on the 3rd November, and planted with cowpea on the 29th of the same month. The crop of peas was ploughed under on the 11th February, 1921. It was again ploughed and subsoiled to a depth of 18 to 19 inches on the 22nd March, and the final ploughing with the disc plough was made on the 31st March, altogether four ploughings. The canes, after ploughing, struck well, with the exception of Java 100 Bont and Java E.K. 1, and although the misses were supplied, some came through slowly while others failed to germinate. Java E.K.28 also had a small number of misses, which were supplied; none of the other canes required supplies. All the canes made excellent growth and were very well forward at the end of the year, and from then onwards continued to make fair growth. Owing to the fact that the cane was planted early and the season being good till the end of the year, the crop results in most varieties were good and much better than any cane planted in the Spring. Java E.K.^{28} is the most promising cane. M.168^{04} is also good, but showed a slight tendency to disease, as also did H.Q. 77, which had a dry

pithy centre when cut. Shahjahanpur grew very well, cutting a good tonnage and having a high c.c.s. content. The Hawaiian varieties 109 and 146 are fairly good; the latter grows very tall and erect. Further comment will be made after next crop, when it is seen how the different varieties ratoon.

The following are the analytical tables:—

First Preliminary Examination in Experiments with Varieties of Cane Recently Introduced in Comparison with Q. 813 and N.G. 24B (Green Goru). June, 1922—Plant Crop.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.
Q. 813	7–6–22	14 months	19·8	18·22	14·39	92·0
N.G. 24B (Goru)	7–6–22	14 months	18·3	15·57	11·75	85·1
Shahjahanpur	7–6–22	14 months	20·2	18·72	14·90	92·6
H.Q. 77	7–6–22	14 months	19·0	17·16	13·45	93·1
M. 168[04]	7–6–22	14 months	17·2	13·85	10·05	80·5
Java E.K. 28	7–6–22	14 months	18·8	16·15	12·26	85·9
Java E.K. 2	7–6–22	14 months	15·2	11·69	8·19	76·8
Java E.K. 1	7–6–22	14 months	17·1	13·53	9·69	79·1
Java 247 (Generatie)	7–6–22	14 months	17·7	14·33	10·44	80·9
Java 100 Bont	7–6–22	14 months	16·7	12·94	9·12	77·4
H. 109	7–6–22	14 months	18·0	15·42	11·69	85·7
H. 146	7–6–22	14 months	18·8	16·63	12·87	88·4
H. 227	7–6–22	14 months	18·3	15·13	11·19	82·6

Second Progressive Examination in Experiments with Varieties of Cane Recently Introduced in Comparison with Q. 813 and N.G. 24B (Green Goru). July, 1922—Plant Crop.

Variety of Cane.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.
Q. 813	6–7–22	15 months	21·8	20·66	16·66	94·7
N.G. 24B	6–7–22	15 months	20·2	17·59	13·48	87·0
Shahjahanpur	6–7–22	15 months	19·2	17·24	13·47	89·8
H.Q. 77	6–7–22	15 months	19·6	18·02	14·28	91·0
M. 168[04]	6–7–22	15 months	19·9	17·8	13·87	89·4
Java E.K. 28	6–7–22	15 months	21·0	19·28	15·26	91·8
Java E.K. 2	6–7–22	15 months	15·9	11·84	8·08	74·4
Java E.K. 1	6–7–22	15 months	19·1	16·20	12·2	84·8
Java 247 (Generatie)	6–7–22	15 months	19·2	16·57	12·62	86·3
Java 100 Bont	6–7–22	15 months	16·5	12·19	8·26	73·8
H. 109	6–7–22	15 months	19·3	16·99	13·11	88·0
H. 146	6–7–22	15 months	19·6	17·81	13·02	90·8
H. 227	6–7–22	15 months	19·9	17·78	13·85	89·3

Third Progressive Examination in Experiments with Varieties of Cane Recently Introduced in Comparison with Q. 813 and N.G. 24B (Green Goru). August, 1922—Plant Crop.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	% Purity of Juice.
Q. 813	2–8–22	16 months	21·2	19·97	16·05	94·2
N.G. 24B	2–8–22	16 months	20·3	19·29	15·58	95·0
Shahjahanpur	2–8–22	16 months	20·6	19·67	14·96	95·5
H.Q. 77	2–8–22	16 months	20·0	18·77	15·05	93·8
M. 168[04]	2–8–22	16 months	17·3	15·48	12·07	89·4
Java E.K. 28	2–8–22	16 months	20·6	19·69	15·95	95·5
Java E.K. 2	2–8–22	16 months	16·2	14·01	10·60	86·4
Java E.K. 1	2–8–22	16 months	19·0	17·42	13·36	91·7
Java 247 (Generatie)	2–8–22	16 months	19·5	18·79	14·37	96·3
Java 100 Bont	2–8–22	16 months	18·0	16·29	12·78	90·5
H. 109	2–8–22	16 months	19·3	18·08	14·04	93·5
H. 146	2–8–22	16 months	20·3	19·67	16·05	96·9
H. 227	2–8–22	16 months	20·5	19·40	15·63	94·6

FINAL EXAMINATION IN EXPERIMENTS WITH VARIETIES OF CANE RECENTLY INTRODUCED IN COMPARISON WITH Q. 813 AND N.G. 24B (GREEN GORU). SEPTEMBER, 1922—PLANT CROP.

Variety.	Date of Analysis.	Age of Cane.	% Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	% C.C.S. in Cane.	Purity of Juice.	% Fibre in Cane.	Date of Arrowing.
Q. 813	8–9–22	17 months	21·3	19·97	·14	15·81	93·7	12·0	20 August (sparsely)
N.G. 24B (Goru)	8–9–22	17 months	19·6	18·13	·59	14·68	92·5	9·5	..
Shahjahanpur	8–9–22	17 months	20·6	19·37	·25	14·22	94·0	17·9	..
H.Q. 77	8–9–22	17 months	19·6	18·61	·21	14·93	94·9	11·6	17 August (sparsely)
M. 168[04]	8–9–22	17 months	18·4	16·84	·77	13·30	91·5	11·0	20 July (sparsely)
Java E.K. 28	8–9–22	17 months	20·8	19·89	·22	15·83	95·6	12·4	..
Java E.K. 2	8–9–22	17 months	16·8	14·71	1·40	11·03	87·5	12·9	14 July (sparsely)
Java E.K. 1	8–9–22	17 months	18·6	16·87	·95	12·86	90·7	13·7	..
Java 247 (Generatie)	8–9–22	17 months	18·8	18·00	·27	13·67	95·7	16·5	..
Java 100 Bont	8–9–22	17 months	17·8	15·95	·62	12·22	89·6	12·7	..
H. 109	8–9–22	17 months	19·3	18·64	·36	14·73	96·5	13·7	14 July (freely)
H. 146	8–9–22	17 months	19·5	18·61	·23	14·97	95·4	11·4	..
H. 227	8–9–22	17 months	19·7	18·61	·21	14·89	94·4	10·5	10 June (freely)

Appended are the results of the plant crop:—

CROP RESULTS IN EXPERIMENTS WITH VARIETIES OF CANE RECENTLY INTRODUCED IN COMPARISON WITH Q. 813 AND N.G. 24B (GREEN GORU). PLANT CROP, 1922.

Variety.	Age of Cane.	Yield of Cane per acre in English Tons.	Yield of Commercial Cane Sugar per acre in English Tons.
Q. 813	17 months	46·5	7·35
N.G. 24B (Goru)	17 months	38·4	5·63
Shahjahanpur	17 months	43·5	6·18
H.Q. 77	17 months	39·8	5·94
M. 168[04]	17 months	46·1	6·13
Java E.K. 28	17 months	48·5	7·67
Java E.K. 2	17 months	60·3	6·65
Java E.K. 1	17 months	38·8	4·98
Java 247 (Generatie)	17 months	47·0	6·42
Java 100 Bont	17 months	31·2	3·81
H. 109	17 months	37·7	5·55
H. 146	17 months	36·0	5·39
H. 227	17 months	28·6	4·25

The following mixture of manure was applied at the end of August:—

100 lb. sulphate of ammonia
100 lb. nitrate of soda
100 lb. muriate of potash
300 lb. superphosphate

600 lb. per acre.

The manure was applied in furrows 10 inches from the cane and 4 inches deep and then scarified. The furrows were made on both sides of the row of cane.

In December an additional dressing of nitrogenous manures was made, consisting of a mixture of 75 lb. sulphate of ammonia and 40 lb. nitrate of soda per acre, applied as a top dressing.

DISTRIBUTION OF CANE VARIETIES FROM THE MACKAY STATION.

This year the free distribution of varieties took place in June, about the same number of farmers called as last year. Besides the Queensland seedlings, the best of the Java and Hawaiian varieties were taken by farmers, also 7 R 428 (Pompey), M.Q. No. 1, D.1457, and Shahjahanpur. The most promising of the new varieties are Java E.K.[28], H.146, M.168[04]. These were the varieties mostly taken. Pompey was also taken freely as it ratoons well, the c.c.s. being fairly good. Farmers living in localities subject to frost took the Shahjahanpur variety to give it a trial. On this year's results the crop and c.c.s results are satisfactory. It also ratoons well, having a large number of sticks to the stool. After the distribution, all available cane of this variety was sold for plants; in addition, a few other varieties were also sold in small lots, the total sold being 13 tons. Besides the local distribution, three crates of varieties were sent to Northern centres, and a large number of canes were sent by parcel post.

INTRODUCTION OF VARIETIES.

No new varieties were introduced to this Station during the year, but the new varieties received last year, viz., Mauritius 28/10, 32/10, 55/11, 55/1182, H.Q. 409, and Q. 116 Sport have been planted out more extensively.

The following varieties were reintroduced last year from Kairi State Farm, Atherton Tableland, where they had been growing for the past seven years, viz.—Badila, Meera, Striped Singapore, and Rose Bamboo. These were planted out again this year.

Dates of Arrowing of Different Varieties.

Petite Senneville	1st Ratoons	7th June
Q. 1133	1st Ratoons	10th June
M. 89	1st Ratoons	10th June
H. 227	Plant	10th June
Q. 1092	1st Ratoons	7th July
D. 1135	1st Ratoons	10th July
H. 109	Plant	14th July
Java E.K.^{2}	Plant	14th July
M. 168^{04}	Plant	20th July
H.Q. 77	Plant	17th August
Q. 855	Plant	14th August
Q. 813	Plant	20th August
B. 6450	1st Ratoons	1st August
1900 Seedlings	Plant	14th August

New Experiments Undertaken.

1. Planting experiments—

Different distances between the rows, viz.:—4 ft. 6 in., 5 ft., 6 ft., and 7 ft. All plants 6 inches apart in the drill.

Different distances between plants in the row, viz.—Continuous and 6, 12, 24, and 36 inches apart; all rows being 5 ft. apart.

2. Experiments with lime, viz.—
   Plot 1—Pulverised limestone.
   Plot 2—No lime.
   Plot 3—Burnt lime.
   Plot 4—No lime.

3. Lime and green manure plots—
   Plot 1—Lime and green manure.
   Plot 2—Lime only.

Annual Field Day.

The Annual Field Day of the Mackay Sugar Experiment Station was held on the 20th May last, and another highly successful meeting took place. There was a record attendance present, and the greatest amount of interest was displayed in the cane varieties and cultivation and other experiments. An address on cane cultivation was given by the Director after luncheon, and a demonstration of field implements was carried out during the afternoon.

Yield of Cane, Mackay Station.

The average tonnage of cane per acre on the station this year was considerably below last year, due to the deficient rainfall in the early part of the present year. The early plant cane gave satisfactory returns, but the late planted cane gave low yields; the ratoons were very fair.

	Tons.
Sent to Racecourse Mill	282
Sold for plants	14
Free distribution	8
Used for plants on station	3
	307

Total acreage under cane, 14¼.

Average yield of cane, 21¼ tons per acre.

6.—WORK OF THE SOUTHERN SUGAR EXPERIMENT STATION AT BUNDABERG.

The chemist in charge of the above station, Mr. J. Pringle, has carried out his duties during the past year in a highly creditable manner, and the general appearance of the station is to be commended. Mr. Pringle reports that the foreman, Mr. A. E. Evans, and the teamster, Mr. J. C. Thomsen, are deserving of praise for their careful attention to duty and their keen interest in the up-keep of the institution.

The tables of analytical and crop results appearing in this section of the report, together with notes on weather conditions and growth of crops, have been prepared by Mr. Pringle for the use of the director.

Meteorological.

Following on a comparatively mild winter in 1921 during which good rainfalls were recorded for each month, the growing season from August, 1921, to February, 1922, was for the most part favourable. Only light falls were registered in September and October, 1921, which retarded the growth of the cane for a short period, but it commenced to grow vigorously after the 2½ inches in November, which was maintained until dry conditions, accompanied by fairly high, hot winds set in about the middle of February, and this continued through the following three months, when the cane suffered a severe check, with the result that the crops fell considerably below the February estimate. Fortunately the winter of this year was fairly mild, only a few low-lying places suffering slightly from frost, while the 8 inches of rain received during the four months from June to September yielded sufficient moisture to produce a good strike in the spring planting, and bring the ratoons away, but, as the atmosphere was somewhat cool and the falls of August and September comparatively light, the growth was not very rapid.

Rainfall at the Southern Sugar Experiment Station, Bundaberg, during the Growing Period.

Month.	Rainfall.	Number of Wet Days.
August, 1921	1·280	6
September, 1921	·280	3
October, 1921	·950	4
November, 1921	2·419	7
December, 1921	15·088	10
January, 1922	7·155	7
February, 1922	12·845	16
March, 1922	·430	2
April, 1922	·800	4
May, 1922	·310	4
June, 1922	1·940	4
July, 1922	4·010	3
August, 1922	1·580	5
September, 1922	1·010	4
October, 1922	1·385	6
Total	51·482	85

EXPERIMENTS DEALT WITH IN THIS SECTION OF THE REPORT.

1. Experiments in planting cane on red soils that have been growing lucerne for a number of years. Results from second ratoon crop, 1922, and total results to date.

2. Experiments with pulverised limestone *versus* burnt lime. Results of first ratoon crop, 1922.

3. Experiments to test the action of different quantities of lime per acre. Results from first ratoon crop, 1922.

4. Experiments to test the comparative value of using Plant cane, first ratoon, second ratoon, and third ratoon cane for plants. Results of first ratoon crop, 1922.

5. Experiments to determine the value of subsoiling. Results of first ratoon crop, 1922.

6. Experiments to test the effect of using different parts of the stick for plants. Results of first ratoon crop, 1922.

7. Experiments testing the action of muriate of potash *versus* sulphate of potash on cane juices. Results of plant crop (standover), 1922.

8. Experiments with different kinds of fertilisers. Results of plant crop, 1922.

9. Experiments with cane planted continuously in the row, and 6 inches, 12 inches, 18 inches, 24 inches, and 36 inches apart. Results of plant crop, 1922.

10. Experiments with different methods of planting. Results of plant crop, 1922.

11. Competitive experiments with varieties from Java, Mauritius, Hawaii, India, also D. 1135 and H.Q. 77. Results of plant crop (standover), 1922.

12. Analytical examination of new canes from Mauritius.

13. Analytical examination of miscellaneous canes.

1.—EXPERIMENTS TO TRY WHETHER CANE WILL GROW WELL UPON RED SOILS THAT HAVE CARRIED LUCERNE FOR A NUMBER OF YEARS.

Many farmers in the Woongarra district hold that cane following lucerne upon red soil will not do well, or may fail to grow at all. The land chosen for the experiment had been carrying successive growths of lucerne for a period of ten years, and was divided into three plots as under:—

Plot 1.—Treated with lime and green manure before planting.

Plot 2.—Treated with lime only.

Plot 3.—No lime or green manure.

Particulars of the plant crop and first ratoon crop appeared in previous reports, and the results of this year's second ratoon crop show similar results, which will be dealt with later.

As soon as the first ratoon crop was removed the plots were again ratooned in the usual way and mixed manure applied as follows:—100 lb. sulphate of ammonia; 50 lb. muriate of potash; and 150 lb. superphosphate per acre. The ratoons in each plot came away well, plot 3 being very uniform, while plots 1 and 2 were patchy; good growth was maintained in all the plots till March of this year when dry conditions set in.

The analytical and crop results are given hereunder:—

ANALYTICAL EXAMINATION OF EXPERIMENTS TO TRY WHETHER CANE WILL GROW IN RED SOILS THAT HAVE CARRIED LUCERNE FOR A NUMBER OF YEARS. D. 1135, SECOND RATOON CROP, OCTOBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	One ton of lime per acre applied, and green manure ploughed under before planting with cane	12 months	2–10–22	20·7	19·52	·29	94·1	17·38	15·72
2	D. 1135 ..	One ton of lime per acre applied before planting with cane. No green manure	12 months	2–10–22	20·4	18·97	·20	92·8	16·89	15·11
3	D. 1135 ..	No lime or green manure used	12 months	2–10–22	20·4	19·24	·32	94·3	17·13	15·48

CROP RESULTS OF EXPERIMENTS TO TRY WHETHER CANE WILL GROW IN RED SOILS THAT HAVE CARRIED LUCERNE FOR A NUMBER OF YEARS. D. 1135, SECOND RATOON CROP.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane in English Tons.	Yield of Commercial Cane Sugar in English Tons.
1	D. 1135 ..	One ton of lime per acre applied, and green manure ploughed under before planting with cane	12 months	19·05	2·99
2	D. 1135 ..	One ton of lime per acre applied before planting with cane. No green manure	12 months	17·27	2·61
3	D. 1135 ..	No lime or green manure used	12 months	19·86	3·07

It will be observed that this year, as on previous occasions, Plot 3 gave the highest yield, though not greatly in excess of Plot 1. As stated previously the action of lime on the red soils has so far proved negative.

The total crop results of these experiments appear below:—

TOTAL CROP RESULTS TO DATE OF EXPERIMENTS TO TRY WHETHER CANE WILL GROW IN RED SOILS THAT HAVE CARRIED LUCERNE FOR A NUMBER OF YEARS.

Plot No.	Variety of Cane.	Treatment.	Plant Crop, 1920—Standover.		First Ratoon Crop, 1921—Thirteen Months.		Second Ratoon Crop, 1922—Twelve Months.		Total Results for Three Crops.		Average for Three Crops.	
			Yield of Cane per acre in English tons.	Yield of C.C.S. per acre in English tons.	Yield of Cane per acre in English tons.	Yield of C.C.S. per acre in English tons.	Yield of Cane per acre in English tons.	Yield of C.C.S. per acre in English tons.	Yield of Cane per acre in English tons.	Yield of C.C.S. per acre in English tons.	Yield of Cane per acre in English tons.	Yield of C.C.S. per acre in English tons.
1	D. 1135..	One ton of lime per acre applied, and green manure crop ploughed under before planting with cane	16·77	2·39	22·37	3·53	19·05	2·99	58·19	8·91	19·39	2·97
2	D. 1135..	One ton of lime per acre applied before planting with cane. No green manure	15·88	2·09	22·13	3·19	17·27	2·61	55·28	7·89	18·43	2·61
3	D. 1135..	No lime or green manure used	19·42	2·98	24·21	3·56	19·86	3·07	63·49	9·61	21·16	3·20

During the season, analyses of the soil from these three plots were carried out separately, and they may help to throw some light on this and other puzzling results obtained at this station. It was found that the pounds per acre of available potash in plot 3 exceeded plot 1 by 98 lb., and of plot 2 by 213 lb. The phosphoric acid and humus content was also better in plot 3. Those plots adjoin one another and are on apparently uniform soil.

As the above results (apart from the green manure and lime having no appreciable result) are good, the contention that cane will not do well after lucerne on red soils appears to be without foundation.

2. —EXPERIMENTS WITH PULVERISED LIMESTONE VERSUS BURNT LIME AND NO LIME.

After taking the standover plant crop off in August, 1921, all plots were ratooned in the usual way, and the cane came away well in each case, no manure being applied. With regard to the growth of the cane there was apparently little difference in the plots at first, but after a few weeks plots 1 and 3 were somewhat in the lead, plot 2 inclined to be patchy. After the dry conditions set in in February of this year plot 2 fell away quickly, both in growth and colour, while the other two maintained their colour, though the growth was retarded. The cane was cut in September of this year, the results being consistent with the previous crop.

The analytical and crop results of the first ratoons of this experiment will be found hereunder:—

ANALYTICAL EXAMINATION OF EXPERIMENTS USING PULVERISED LIMESTONE, BURNT LIME, AND NO LIME. D. 1135, FIRST RATOON CROP.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	One ton pulverised limestone per acre	13 months	6–9–22	20·0	18·72	·37	93·6	16·67	14·98
2	D. 1135 ..	One ton burnt lime per acre	13 months	6–9–22	20·0	18·69	·41	93·4	16·64	14·94
3	D. 1135 ..	No lime	13 months	6–9–22	20·1	18·66	·38	92·3	16·61	14·85

CROP RESULTS OF EXPERIMENTS USING PULVERISED LIMESTONE, BURNT LIME, AND NO LIME. D. 1135, FIRST RATOON CROP, SEPTEMBER, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	One ton pulverised limestone per acre	13 months	21·11	3·16
2	D. 1135 ..	One ton burnt lime per acre	13 months	17·92	2·68
3	D. 1135 ..	No lime	13 months	20·62	3·06

The results of this experiment are much the same as last year, and these are disappointing. There is only a very slight increase—·49 ton for the use of the pulverised limestone, while the use of burnt limestone appears to have been prejudicial in its effect seeing that there is a falling off of 3·19 tons when compared with the pulverised limestone and a decrease of 2·70 tons compared with the plot receiving no lime. Analytical tests of these 3 plots show that plot 2 is inferior in potash and phosphoric acid to plots 1 and 3.

3.—Further Experiments with Lime.

In the light of previous trials of lime, it was a matter of some doubt whether 1 ton of lime was sufficient to apply. In Hawaii, up to 7 tons of pulverised limestone per acre are put on. An experiment, therefore, was laid down in which varying quantities of lime were used:—

Plot 1 received no lime.

Plot 2 received 1 ton per acre.

Plot 3 received 2 tons per acre.

Plot 4 received 3 tons per acre.

Plot 5 received 4 tons per acre.

Plot 6 received 5 tons per acre.

Plot 7 received 6 tons per acre.

The results of the standover plant crop appear in last year's report. As soon as this was cut the plots were ratooned as usual. The cane came away well. The analytical and crop results are given below.

Analytical Examination of Experiments to Test the Action of Different Quantities of Lime per Acre on Cane Crops, the Quantities of Lime in the Form of Pulverised Limestone Varying from 1 to 6 Tons per Acre. D. 1135.—First Ratoon Crop.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	No lime	13 months	19–9–22	20·5	19·35	·14	94·4	17·23	15·55
2	D. 1135 ..	One ton pulverised limestone per acre	13 months	19–9–22	20·7	19·68	·18	95·0	17·52	15·88
3	D. 1135 ..	Two tons pulverised limestone per acre	13 months	19–9–22	20·4	19·22	·20	94·2	17·11	15·44
4	D. 1135 ..	Three tons pulverised limestone per acre	13 months	19–9–22	21·0	20·04	·17	95·4	18·84	16·20
5	D. 1135 ..	Four tons pulverised limestone per acre	13 months	19–9–22	20·5	19·41	·18	94·6	17·28	15·65
6	D. 1135 ..	Five tons pulverised limestone per acre	13 months	19–9–22	20·0	18·87	·21	94·3	16·80	15·04
7	D. 1135 ..	Six tons pulverised limestone per acre	13 months	19–9–22	19·4	18·53	·21	93·1	16·50	14·80

Crop Results of Experiments to Test the Action of Different Quantities of Lime per Acre on Cane Crops: the Quantities of Lime in the Form of Pulverised Limestone Varying from 1 to 6 Tons per Acre. D. 1135.—First Ratoon Crop.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	No lime	13 months	19·70	3·05
2	D. 1135 ..	One ton pulverised limestone per acre	13 months	21·74	3·45
3	D. 1135 ..	Two tons pulverised limestone per acre	13 months	24·15	3·73
4	D. 1135 ..	Three tons pulverised limestone per acre	13 months	23·82	3·85
5	D. 1135 ..	Four tons pulverised limestone per acre	13 months	21·67	3·39
6	D. 1135 ..	Five tons pulverised limestone per acre	13 months	24·01	3·62
7	D. 1135 ..	Six tons pulverised limestone per acre	13 months	22·86	3·38

It was stated in last year's report that the results of this experiment were most unsatisfactory. This is decidedly borne out by this year's crop results. The highest yield this year is in plot 3; last year plot 4 gave the highest. Plot 5 is still low, though the no-lime plot is this year the lowest of all. The plot to which the most lime was applied, viz., 6 tons per acre, shows a lower result than the plot to which only 2 tons were applied. Taking the average of the limed plots in comparison with the plot with no lime —an additional yield of 3·34 tons is obtained for an average application of 3½ tons of lime. This would not be a payable proposition at the present price of lime.

4.—Experiments to Test the Comparative Value of Using Plant, First Ratoon, Second Ratoon, and Third Ratoon Cane for Plants.

After the standover plant crop was removed in September, 1921, the plots were ratooned. The cane made fair growth, and in December was fertilised at the following rate per acre:—

Sulphate of ammonia	100 lb.
Muriate of potash	50 lb.
Superphosphate	150 lb.

Hereunder are given the analytical and crop results:—

Analytical Examination of Experiments to Test the Comparative Values of Using Plant Cane, First Ratoon Cane, Second Ratoon Cane, and Third Ratoon Cane for Providing Plants. D. 1135—First Ratoon Crop—September, 1922.

Plot Number.	Variety of Cane.	Plants Cut from—	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Plant cane	12 months	21–9–22	20·1	18·97	·20	94·3	16·89	15·11
2	D. 1135 ..	First ratoons	12 months	21–9–22	21·1	20·00	·18	94·8	17·80	16·11
3	D. 1135 ..	Second ratoons	12 months	21–9–22	20·2	19·11	·18	94·6	17·01	15·40
4	D. 1135 ..	Third ratoons	12 months	21–9–22	20·0	19·11	·21	95·5	17·01	15·50

Crop Results of Experiments to Test the Comparative Values of Using Plant Cane, First Ratoon Cane, Second Ratoon Cane, and Third Ratoon Cane for Providing Plants. D. 1135—First Ratoon Crop—September, 1922.

Plot Number.	Variety of Cane.	Plants Cut from—	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	Plant cane	12 months	18·78	2·85
2	D. 1135 ..	First ratoons	12 months	16·11	2·59
3	D. 1135 ..	Second ratoons	12 months	18·06	2·78
4	D. 1135 ..	Third ratoons	12 months	19·56	3·03

The results are consistent with last year's figures, which were quite unexpected, although the difference between plots 1 and 4 are slight. It appears to show that in Southern districts at any rate third ratoons may make good plants.

5.—Experiments to Determine the Value of Subsoiling.

A further effort is being made to ascertain whether an increased yield can be obtained from subsoiling the red soils. So far, little difference has been obtained in previous experiments in this class of soil. A portion of land was, therefore, subsoiled to 20 inches deep, and another portion, adjacent, of uniform land, left unsubsoiled, being only ploughed to a depth of 12 inches. With these exceptions, the remaining cultural operations were the same, the variety used for the experiment being D. 1135.

After the standover plant cane was cut the plots were ratooned. Plot 1 was subsoiled to a depth of from 18 to 20 inches, while plot 2 was ratooned in the ordinary manner to 9 inches deep. During its growth the cane appeared to be uniform in each plot up till February when the colour in plot 1 appeared darker, and to the eye it looked as if it would yield the highest tonnage. In the plant crop, the non-subsoiled plot gave decidedly the best result. When the first ratoon crop was cut and weighed, it was found that the subsoiled plot was again the lightest.

The following tables set out the analytical and crop figures:—

Analytical Examination of Experiments to Determine the Value of Subsoiling. D. 1135—First Ratoon Crop—October, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Ratooned in usual way, and subsoiled to 20 inches	12 months	16–10–22	20·7	19·30	·45	93·2	17·18	15·42
2	D. 1135 ..	Ratooned by ploughing 9 inches deep, not subsoiled	12 months	16–10–22	19·9	18·66	·34	93·2	16·61	14·95

Crop Results of Experiments to Determine the Value of Subsoiling. D. 1135—First Ratoon Crop—October, 1922.

Plot Number	Variety of Cane.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	Ratooned in usual way and subsoiled to 20 inches ..	12 months	12·14	1·87
2	D. 1135 ..	Ratooned by ploughing 9 inches deep, not subsoiled ..	12 months	14·76	2·21

The decrease for subsoiling the plant crop and first ratoon crop was 4·99 tons and 2·62 tons of cane respectively. The average decrease for subsoiling the two crops was 3·80 tons. This is a very different result than is obtained by subsoiling the alluvial soils at Mackay. It is in all probability due to the very porous, open nature of the soil.

6.—Experiments using Different Parts of the Stick for Plants.

This has been tried in so far as tops, middles, and middles and bottoms are concerned, but in this experiment all the plants in a stick are being used separately—*i.e.*, top plants, second three eyes, third three eyes, and so on, including bottoms.

After the removal of the plant crop in October, 1921, the crop was ratooned and the cane came away well. In December the following mixed manure was applied per acre:—

Sulphate of ammonia	100 lb.
Muriate of potash	50 lb.
Superphosphate	150 lb.

The analytical and crop data follow:—

Analytical Examination of Experiments Testing the Effect of Using Different Parts of the Sticks of Cane for Plants. First Ratoon Crop, 1900 Seedling, October, 1922.

Plot Number.	Variety of Cane.	Portion of Stick Used.	Age of Cane.	Date of Analysis.	Density of Juice. (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	1900 Seedling	Top plants, three eyes	12 months	9–10–22	21·4	20·30	·88	94·9	17·97	16·40
2	1900 Seedling	Second three eyes	12 months	9–10–22	21·2	20·30	·91	95·7	17·97	16·47
3	1900 Seedling	Third three eyes	12 months	9–10–22	21·7	20·88	·61	95·8	18·59	16·96
4	1900 Seedling	Fourth three eyes	12 months	9–10–22	21·1	20·04	·87	94·9	17·84	16·18
5	1900 Seedling	Fifth three eyes	12 months	9–10–22	21·7	20·75	·71	95·7	18·47	16·81
6	1900 Seedling	Sixth three eyes	12 months	9–10–22	21·2	20·27	·94	95·6	18·05	16·41
7	1900 Seedling	Seventh three eyes (butts)	12 months	9–10–22	22·1	21·11	·84	95·5	18·79	17·11

Crop Results of Experiments Testing the Effect of Using Different Parts of the Sticks of Cane for Plants. First Ratoon Crop, 1900 Seedling, October, 1922.

Plot Number.	Variety of Cane.	Portion of Stick Used.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	1900 Seedling	Top plants, three eyes	12 months	15·07	2·47
2	1900 Seedling	Second three eyes	12 months	16·83	2·77
3	1900 Seedling	Third three eyes	12 months	15·09	2·56
4	1900 Seedling	Fourth three eyes	12 months	14·83	2·40
5	1900 Seedling	Fifth three eyes	12 months	14·56	2·45
6	1900 Seedling	Sixth three eyes	12 months	13·32	2·19
7	1900 Seedling	Seventh three eyes (butts)	12 months	14·57	2·53

The results of the above show that the first three plants, *i.e.*, tops, second three eyes, and third three eyes, have given the best results. The butts, which gave the best yield in the plant crop, have fallen behind in the first ratoon crop.

7.—Potash Tests—Experiments Testing the Action of Muriate of Potash versus Sulphate of Potash on Cane Juices

In the application of these fertilisers the same amount of potash has been used in both salts.

After ploughing the old stools in November, 1919, the land was sown with cowpea, and in March 1920, a fairly heavy crop of green manure was ploughed in and allowed to decay. After receiving two further cross ploughings and harrowings, the cane was planted in September and struck well. In November the potash was applied very carefully according to the quantity for each plot, and the effects of the manure were very soon apparent, those plots receiving an application being well ahead in growth and much darker in colour in a few weeks, particularly plots 8 and 1 with the largest applications. This was very marked until the dry spell in the spring months of 1921, when all the plots fell away considerably both in growth and colour. The falling away in colour was more marked in the unmanured plots. The cane was cut in the middle of July, 1922, and owing to the dry conditions from the middle of February, the cane being a twenty-one-months' standover crop, there was a considerable quantity of dead stuff, more particularly in the two unmanured

plots followed by the three muriate plots, while in the sulphate plots there was not so much, plot 8 having very little.

This experiment is an additional one to that already reported upon at the Mackay Station, only, being on a much larger scale, it is possible to give the weights as well as the chemical data. Primarily, however, this experiment is a chemical test of cane juices, so that the analytical tables are the more important. Chemical tests were commenced in December, 1921, and in January, February, and March of this year. They were then discontinued till June as the sugar content was dropping. The following are the analytical results:—

Analytical Results of Experiments Testing the Action of Muriate of Potash versus Sulphate of Potash on Cane Juices. D. 1135, Plant Crop, December, 1921.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	282 lb. muriate of potash per acre	14 months	1–12–21	21·3	19·52	·63	91·6	17·38	15·43
2	D. 1135 ..	188 lb. muriate of potash per acre	14 months	1–12–21	20·7	19·51	·83	94·2	17·37	15·70
3	D. 1135 ..	94 lb. muriate of potash per acre	14 months	1–12–21	21·1	19·65	·62	93·1	17·49	15·68
4	D. 1135 ..	No manure applied ..	14 months	1–12–21	20·6	18·87	·54	91·6	16·80	14·90
5	D. 1135 ..	No manure applied ..	14 months	1–12–21	20·4	18·58	·70	91·1	16·54	14·63
6	D. 1135 ..	100 lb. sulphate of potash per acre	14 months	1–12–21	20·6	19·24	·58	93·4	17·13	15·39
7	D. 1135 ..	200 lb. sulphate of potash per acre	14 months	1–12–21	20·7	19·48	·68	94·1	17·34	15·63
8	D. 1135 ..	300 lb. sulphate of potash per acre	14 months	1–12–21	20·5	19·11	·53	93·2	17·01	15·28

Analytical Results of Experiments Testing the Action of Muriate of Potash versus Sulphate of Potash on Cane Juices. D. 1135, Plant Crop, January, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix)	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	282 lb. muriate of potash per acre	15 months	7–1–22	16·8	15·11	·79	89·9	13·34	11·82
2	D. 1135 ..	188 lb. muriate of potash per acre	15 months	7–1–22	16·6	14·96	1·05	90·1	13·32	11·71
3	D. 1135 ..	94 lb. muriate of potash per acre	15 months	7–1–22	16·9	15·38	1·35	91·0	13·69	12·10
4	D. 1135 ..	No manure applied ..	15 months	7–1–22	14·9	12·99	1·95	87·1	11·57	10·00
5	D. 1135 ..	No manure applied ..	15 months	7–1–22	14·8	12·83	1·92	86·7	11·43	9·81
6	D. 1135 ..	100 lb. sulphate of potash per acre	15 months	7–1–22	15·4	13·63	1·60	87·7	12·14	10·60
7	D. 1135 ..	200 lb. sulphate of potash per acre	15 months	7–1–22	15·2	13·28	1·56	87·3	11·82	10·19
8	D. 1135 ..	300 lb. sulphate of potash per acre	15 months	7–1–22	15·7	13·91	1·30	88·7	12·38	10·80

Analytical Examination of Experiments Testing the Action of Muriate of Potash versus Sulphate of Potash on Cane Juices. D. 1135—Plant Crop—February, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix)	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	282 lb. muriate of potash per acre	16 months	7–2–22	14·1	11·85	1·06	84·0	10·55	8·80
2	D. 1135 ..	188 lb. muriate of potash per acre	16 months	7–2–22	13·6	11·07	2·12	81·4	9·86	8·11
3	D. 1135 ..	94 lb. muriate of potash per acre	16 months	7–2–22	12·6	9·82	2·53	78·0	8·74	7·00
4	D. 1135 ..	No manure	16 months	7–2–22	12·7	9·70	2·31	76·3	8·64	6·80
5	D. 1135 ..	No manure	16 months	7–2–22	11·6	8·31	2·73	71·5	7·49	5·53
6	D. 1135 ..	100 lb. sulphate of potash per acre	16 months	7–2–22	12·2	9·13	2·53	74·8	8·13	6·29
7	D. 1135 ..	200 lb. sulphate of potash per acre	16 months	7–2–22	12·1	8·76	2·97	72·2	7·78	5·86
8	D. 1135 ..	300 lb. sulphate of potash per acre	16 months	7–2–22	13·2	10·55	2·19	79·9	8·95	7·75

Analytical Examination of Experiments Testing the Action of Muriate of Potash versus Sulphate of Potash on Cane Juices. Plant Crop, March, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix.)	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	282 lb. muriate of potash per acre	17 months	7–3–22	13·1	10·10	2·55	77·1	8·99	7·09
2	D. 1135 ..	188 lb. muriate of potash per acre	17 months	7–3–22	12·7	9·71	3·05	76·4	8·65	6·77
3	D. 1135 ..	94 lb. muriate of potash per acre	17 months	7–3–22	12·4	9·34	2·97	75·4	8·32	6·43
4	D. 1135 ..	No manure	17 months	7–3–22	11·2	7·66	3·37	68·4	6·82	3·80
5	D. 1135 ..	No manure	17 months	7–3–22	10·5	6·98	3·78	66·5	6·21	4·28
6	D. 1135 ..	100 lb. sulphate of potash per acre	17 months	7–3–22	10·7	7·32	3·05	68·4	6·52	4·61
7	D. 1135 ..	200 lb. sulphate of potash per acre	17 months	7–3–22	10·1	6·44	3·37	63·6	5·73	3·75
8	D. 1135 ..	300 lb. sulphate of potash per acre	17 months	7–3–22	11·6	7·87	3·28	67·9	7·01	4·83

Analytical Examination of Experiments to Test the Action of Muriate of Potash in Comparison with Sulphate of Potash on Cane Juices. Plant Crop, D. 1135—June, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	282 lb. muriate of potash per acre	20 months	26–6–22	19·8	17·47	1·16	88·2	15·55	13·45
2	D. 1135 ..	188 lb. muriate of potash per acre	20 months	26–6–22	18·9	17·12	1·89	90·5	15·24	13·44
3	D. 1135 ..	94 lb. muriate of potash per acre	20 months	26–6–22	17·8	15·21	1·73	85·4	13·53	11·39
4	D. 1135 ..	No manure	20 months	26–6–22	19·2	16·98	1·18	88·4	15·12	13·12
5	D. 1135 ..	No manure	20 months	26–6–22	15·9	12·56	2·08	79·0	11·18	8·99
6	D. 1135 ..	100 lb. sulphate of potash per acre	20 months	26–6–22	17·7	14·22	2·31	80·3	12·66	10·32
7	D. 1135 ..	200 lb. sulphate of potash per acre	20 months	26–6–22	15·9	12·77	2·23	80·3	11·37	9·22
8	D. 1135 ..	300 lb. sulphate of potash per acre	20 months	26–6–22	17·1	13·80	2·15	80·7	12·29	10·03

Analytical Examination of Experiments to Test the Action of Muriate of Potash in Comparison with Sulphate of Potash on Cane Juices. Plant Crop, D. 1135.—July, 1922.

Plot Number	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	282 lb. muriate of potash per acre	21 months	19–7–22	18·7	16·37	1·03	87·5	14·57	12·55
2	D. 1135 ..	188 lb. muriate of potash per acre	21 months	19–7–22	19·8	18·10	·58	91·4	16·20	14·28
3	D. 1135 ..	94 lb. muriate of potash per acre	21 months	19–7–22	17·8	15·66	1·15	87·9	14·94	12·07
4	D. 1135 ..	No manure	21 months	19–7–22	18·3	16·83	·57	91·9	14·98	13·36
5	D. 1135 ..	No manure	21 months	19–7–22	17·2	15·53	·84	90·2	13·83	12·21
6	D. 1135 ..	100 lb. sulphate of potash per acre	21 months	19–7–22	17·5	15·05	1·23	86·0	13·40	11·44
7	D. 1135 ..	200 lb. sulphate of potash per acre	21 months	19–7–22	17·2	14·97	1·45	87·0	13·33	11·47
8	D. 1135 ..	300 lb. sulphate of potash per acre	21 months	19–7–22	18·4	16·48	1·01	89·5	14·67	12·80

It will be noticed from the above that the tests bear out those made at Mackay—viz., that the muriate of potash apparently has no prejudicial effect on cane juices. In fact, in all the tests the c.c.s. and purity are on the average better when the muriate of potash was used than when the sulphate of potash was employed.

The crop results are embodied hereunder:—

Crop Results of Experiments to Test the Action of Muriate of Potash in Comparison with Sulphate of Potash on Cane Juices. Plant Crop—July, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	282 lb. muriate of potash per acre	21 months	41·75	5·24
2	D. 1135 ..	188 lb. muriate of potash per acre	21 months	39·68	5·66
3	D. 1135 ..	94 lb. muriate of potash per acre	21 months	35·53	4·09
4	D. 1135 ..	No manure	21 months	26·29	3·51
5	D. 1135 ..	No manure	21 months	28·54	3·47
6	D. 1135 ..	100 lb. sulphate of potash per acre	21 months	38·25	4·38
7	D. 1135 ..	200 lb. sulphate of potash per acre	21 months	37·90	4·35
8	D. 1135 ..	300 lb. sulphate of potash per acre	21 months	47·67	6·10

From the above it will be noted that the highest yield is in plot 8, where 300 lb. of sulphate of potash was applied. This dressing contained the same amount of potash as was given to plot 1 in the 282 lb. of muriate of potash.

The plots receiving potash stand out well above those with no manure, and it may be interesting to give the averages:—

3 plots receiving muriate of potash. Average yield 38·95 tons.

2 plots receiving no potash. Average yield 27·21 tons

3 plots receiving sulphate of potash. Average yield 41·27 tons.

Increase due to muriate of potash, 11·74 tons.

Increase due to sulphate of potash, 14·06 tons.

It has always been recognised by the Experiment Station that potash was a vital necessity on the red soils, and this has been amply proved by the above experiment. Taking the largest application of potash in plots 1 and 8 the increase for potash over the average of the two unmanured plots is 14·54 tons and 20·40 tons of cane respectively.

8.—Trials with Different Forms of Fertilisers.

After ploughing out the stools from the previous crop in October, 1920, the land received an application of 1 ton of burnt lime per acre, which was harrowed in. Early in November the block was sown with cowpea which germinated well, and in February, 1921, a fairly good crop of green manure was turned in and allowed to decay. After receiving two further cross ploughings and harrowings, the cane was planted in August and a good strike obtained in all plots. At the beginning of December the various fertilisers were very carefully applied to each plot.

The analytical figures are set out below:—

Analytical Examination of Experiments with Different Kinds of Fertilisers. D. 1135—Plant Crop—October, 1922.

Plot Number.	Variety of of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	300 lb. sulphate of potash per acre	13 months	30–10–22	22·2	20·97	·31	94·4	18·67	16·61
2	D. 1135 ..	200 lb. sulphate of ammonia per acre	13 months	30–10–22	21·5	20·40	·30	94·8	18·16	16·45
3	D. 1135 ..	265 lb. nitrate of soda per acre	13 months	30–10–22	20·9	19·89	·31	95·1	17·71	16·07
4	D. 1135 ..	300 lb. superphosphate per acre	13 months	30–10–22	20·5	19·41	·28	94·6	17·27	15·64
5	D. 1135 ..	300 lb. basic superphosphate per acre	13 months	30–10–22	20·3	19·30	·32	95·0	17·18	15·60
6	D. 1135 ..	No manure	13 months	30–10–22	19·8	18·64	·43	94·1	16·59	14·99
7	D. 1135 ..	190 lb. bonemeal per acre ..	13 months	30–10–22	20·6	19·65	·26	95·4	17·49	15·91
8	D. 1135 ..	300 lb. Holbourne Island phosphate per acre	13 months	30–10–22	19·6	18·44	·37	94·1	16·42	14·81
9	D. 1135 ..	600 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. muriate of potash, and 300 lb. superphosphate	13 months	30–10–22	20·4	19·27	·38	94·4	17·16	15·50
10	D. 1135 ..	600 lb. mixed manure per acre as in plot 9 applied in two dressings, second application two months after the first	13 months	30–10–22	19·7	18·66	·36	94·2	16·65	15·02
11	D. 1135 ..	600 lb. mixed manure per acre as in plot 9 in one application	13 months	31–10–22	19·6	18·50	·40	94·3	16·47	14·85
12	D. 1135 ..	600 lb. mixed manure per acre containing 100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. muriate of potash, and 300 lb. superphosphate. The nitrogen in this mixture was applied in two dressings	13 months	31–10–22	19·7	18·58	·41	94·1	16·51	14·88
13	D. 1135 ..	No manure	13 months	31–10–22	18·7	17·61	·34	94·1	15·68	14·19

The quotient of purity in all the above plots was excellent. The highest commercial cane sugar was found on the plots with sulphate of potash, sulphate of ammonia, and nitrate of soda. Contrary to previous experiments carried out with fertilisers the non-manured plots were slightly under the average c.c.s.

The following table represents the crop results:—

Crop Results of Experiments With Different Kinds of Fertilisers. D. 1135—Plant Crop—October, 1922.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	300 lb. sulphate of potash per acre	13 months	22·17	3·68
2	D. 1135 ..	200 lb. sulphate of ammonia per acre	13 months	18·09	2·97
3	D. 1135 ..	265 lb. nitrate of soda per acre	13 months	19·36	3·11
4	D. 1135 ..	300 lb. superphosphate per acre	13 months	13·48	2·11
5	D. 1135 ..	300 lb. basic superphosphate per acre	13 months	14·19	2·22
6	D. 1135 ..	No manure	13 months	15·38	2·30
7	D. 1135 ..	190 lb. bonemeal per acre	13 months	16·43	2·62
8	D. 1135 ..	300 lb. Holbourne Island phosphate per acre ..	13 months	16·08	2·38
9	D. 1135 ..	600 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. muriate of potash, and 300 lb. superphosphate	13 months	16·28	2·52
10	D. 1135 ..	600 lb. mixed manure as in plot 9, applied in two dressings. Second application two months after the first	13 months	20·95	3·15
11	D. 1135 ..	600 lb. mixed manure as in plot 9, applied in one dressing	13 months	21·76	3·23
12	D. 1135 ..	600 lb. mixed manure per acre, containing 100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. muriate of potash, and 300lb. superphosphate. The nitrogen in this mixture was applied in two dressings.	13 months	23·40	3·48
13	D. 1135 ..	No manure	13 months	17·00	2·41

After the heavy rain in December, 1921, the effect of the manures became noticeable. At first plots 1, 2, 3, 9, 10, 11, and 12 were in the lead. Somewhat later plots 2, 3, and 9 appeared to fall back in growth though not in colour. Plots 4, 5, 6, 7, and 8 showed very little difference in growth to plots 6 and 13, which were not manured.

In this season's results plot 12 with 600 lb. mixed manure containing 100 lb. sulphate of ammonia, 100 lb. nitrate of soda, 100 lb. muriate of potash, and 300 lb. superphosphate has given the best yield. The nitrogen in this mixture was applied in two dressings. This is the usual practice at the Sugar Experiment Station, Mackay, where it has always been found to give good results.

It is difficult to account for plot 9 with the same mixture applied in one dressing falling so far short of plot 11 with the same mixture applied in the same way, and it goes to show that there are factors operating which have not yet been found out. For instance, in the potash experiments last referred to there was a difference in yield of 2·25 tons of cane per acre between the two unmanured plots side by side and subject to the same conditions as far as could be fixed. In this experiment the two unmanured plots are not side by side, but they also show a difference in yield amounting to 1·62 tons, although apparently on uniform land. If these differences exist between unmanured plots it is reasonable to suppose they will exist between manured plots, therefore results, unless particularly well marked, have to be received with great caution. It will become necessary to lay down a series of plots at the Bundaberg Station to endeavour to find out if possible what variation exists between them.

Taking the results broadly as far as this season is concerned the potash, nitrogen, and mixed fertilisers have given the best yields (excepting plot 9). The difference between the average of the unmanured plots and plot 12, mixed manures, amounts to 7·21 tons of cane per acre, a very payable return. For the use of phosphoric acid alone the bone meal appears to have given the best yield, being higher than either superphosphate or basic superphosphate. All the nitrogen and phosphoric acid in the different forms used in the experiment were calculated to equivalents.

The above trials are of a highly interesting nature, and confirm others that mixed manures are essential for cane crops.

The cane was somewhat young to cut under Bundaberg conditions, and with the dry weather, accounts for the relatively medium tonnages per acre.

9.—Experiments with Cane Planted Continuously in the Row, 6 inches, 12 inches, 18 inches, 24 inches, and 36 inches Apart.

After the old stools of the previous experiments had been ploughed out in October, 1920, and harrowed, the land received an application of 1 ton of burnt lime per acre, and was then sown with cowpea. In February, 1921, a fairly good crop of green manure was turned under and allowed to rot. After receiving two further cross ploughings and harrowings the cane was planted in August, 1921, and came up well. The width between the rows was in all cases 5 feet.

The analytical and crop results are compared in the following tables:—

Analytical Examination of Experiments with Different Widths Between the Plants in the Row. D. 1135.—Plant Crop—October, 1922.

Plot Number.	Variety of Cane.	Distance between Plants.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Continuously in row ..	13 months	31–10–22	21·0	19·96	·40	95·0	17·74	16·11
2	D. 1135 ..	6 inches apart	13 months	31–10–22	21·0	20·04	·34	95·4	17·84	16·20
3	D. 1135 ..	12 inches apart	13 months	31–10–22	20·6	19·40	·41	94·1	17·27	15·58
4	D. 1135 ..	18 inches apart	13 months	31–10–22	20·7	19·68	·33	95·1	17·52	15·88
5	D. 1135 ..	24 inches apart	13 months	31–10–22	20·4	19·08	·36	93·5	16·99	15·28
6	D. 1135 ..	36 inches apart	13 months	31–10–22	20·0	19·03	·41	95·1	16·94	15·40

Crop Results of Experiments with Different Widths Between the Plants in the Row. D. 1135—Plant Crop—October, 1922.

Plot Number.	Variety of Cane.	Distance between Plants.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	Continuously in row	13 months	16·58	2·67
2	D. 1135 ..	6 inches apart	13 months	17·63	2·96
3	D. 1135 ..	12 inches apart	13 months	14·16	2·21
4	D. 1135 ..	18 inches apart	13 months	13·48	2·14
5	D. 1135 ..	24 inches apart	13 months	12·09	1·85
6	D. 1135 ..	36 inches apart	13 months	12·64	1·95

In the analytical table it will be observed that following similar experiments the percentage of sugar is highest where the closer planting is made use of.

From the table of crop results it will be seen that the closer planting gives the highest yield. These results, at any rate in the plant crop, bear out similar experiments made some years ago at Mackay. Experiments have already been made at the Bundaberg Station with the view of ascertaining the best width of row. In these trials it was conclusively proved that cane planted in drills 5 feet apart gave a much higher yield than where it was planted in drills 7 feet apart, and it has been found that the variation in distance between the rows has a far more important bearing on the yield than the variation of the plants in the row. This is borne out in the present experiment, the yield on plots 4, 5, and 6 where the plants were placed 18, 24, and 36 inches apart not showing much difference.

The yield of plot 2 where the canes were planted 6 inches apart in the drill gave the highest return in tonnage of cane and sugar per acre, being practically 5 tons of cane per acre better than in plot 6 where the cane was planted 36 inches apart in the drill.

10.—Experiments in Different Methods of Planting.

(*a*) Planted and covered by hand;

(*b*) Planted by hand and covered with cultivator;

(*c*) Planted and covered with the machine known as the "Cane Planter."

On ploughing out the stools of the previous crop in October, 1920, the land received an application of 1 ton of burnt lime per acre, and in November was sown with cowpea at the rate of 1 bushel per acre, which germinated well. In February, 1921, a good crop of green manure was turned under and allowed to decay, and after two more cross ploughings and harrowings, the cane was planted, the land in each plot being apparently identical. With regard to germination plot 2 was the first to come through, followed closely by plot 3, both of which were well up before plot 1 commenced to show through. Plot 2 kept well in the lead, both in growth and colour, and this was maintained up till time of cutting. The plants in each case were the same (*i.e.*, from ten months' old plant cane).

The tables of analytical and crop data will be found below:—

Analytical Examination of Experiments in Different Methods of Planting. D. 1135—Plant Crop—October, 1922.

Plot Number.	Variety of Cane.	Method of Planting.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Planted and covered by hand	13 months	31–10–22	20·9	19·49	·25	93·2	17·35	15·53
2	D. 1135 ..	Planted by hand and covered with Planet Junior cultivator	13 months	31–10–22	20·5	18·78	·37	91·6	16·72	14·83
3	D. 1135 ..	Machine planted and covered	13 months	31–10–22	20·8	19·71	·27	94·7	17·55	15·90

Crop Results of Experiments in Different Methods of Planting. D. 1135—Plant Crop—October, 1922.

Plot Number.	Variety of Cane.	Method of Planting.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135 ..	Planted and covered by hand	13 months	12·10	1·88
2	D. 1135 ..	Planted by hand and covered with Planet Junior Cultivator	13 months	16·24	2·41
3	D. 1135 ..	Machine planted and covered	13 months	14·52	2·31

From the table of crop results the planting by hand, and using the machine known as the Planet Junior for covering, has given the best yield.

11.—Competitive Experiment with Varieties from Java, Hawaii, Mauritius, and India; also one North Queensland Seedling, and D. 1135 (Reintroduced).

After ploughing out the old stools in November, 1919, the land was sown with cowpea. In March, 1920, a very fair crop of green manure was ploughed under, this was followed by two further cross ploughings after the cowpea was well rotted, and the cane planted. In December, 1920, each plot received an application of mixed fertiliser. With regard to germination E.K. 2 was first through, followed closely by E.K. 28 and H. 227; while Shahjahanpur, H. 146, M. 168[04], D. 1135, J. 247, and 100 Bont all came through at the same time about a week later, with H.Q. 77 and E.K. 1 later still.

After the cane had all germinated the growth of E.K. 2, H. 146, D. 1135, Shahjahanpur, and H.Q. 77 was most rapid, followed by H. 227, and E.K. 28. J. 247 and 100 Bont were about the same, somewhat behind the latter two, while M. 168/04 was considerably behind. E.K. 1 grew very slowly up to about 2 feet, when it commenced to grow vigorously, and in a short time was well above all the others. This was maintained up till time of cutting.

The preliminary and final analytical results of these trials are set out hereunder:—

Preliminary Examination of New Canes from Java, Hawaii, Mauritius, and India; also One North Queensland Seedling and D. 1135. Plant Crop—Standover—July, 1922.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% Fibre in Cane.	% C.C.S. in Cane.
Java	E.K. 1	21 months	28–7–22	19·0	17·17	1·05	90·4	15·38	10·4	13·56
Java	E.K. 2	21 months	28–7–22	16·8	14·47	1·58	86·1	12·79	11·6	10·77
Java	E.K. 28	21 months	28–7–22	15·9	13·99	1·09	87·9	12·69	9·3	10·93
Java	100 Bont	21 months	28–7–22	19·6	17·96	·69	91·3	15·91	11·7	14·06
Java	247 Generatie ..	21 months	28–7–22	19·6	18·38	·27	93·7	16·29	11·5	14·81
Hawaii ..	H. 146	21 months	28–7–22	20·0	18·69	·26	93·4	16·55	11·5	15·05
Hawaii ..	H. 227	21 months	28–7–22	20·4	19·11	·14	93·6	16·88	11·7	15·18
Mauritius ..	M. 168[04]	21 months	28–7–22	20·7	19·15	·14	92·5	17·07	10·9	15·23
Demerara ..	D. 1135	21 months	28–7–22	18·0	15·34	2·27	85·2	13·66	11·0	11·61
India ..	Shahjahanpur No. 10..	21 months	28–7–22	19·2	17·81	·59	92·7	15·59	13·6	13·63
Hambledon, Queensland	H.Q. 77	21 months	28–7–22	18·9	17·47	·61	92·4	15·57	10·9	13·92

Final Examination of New Canes from Java, Hawaii, Mauritius, and India; also One North Queensland Seedling and D. 1135. Plant Crop—Standover—August, 1922.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sugar in Cane.	% Fibre in Cane.	% C.C.S. in Cane.
Java ..	E.K. 1	22 months	23–8–22	19·3	18·00	·91	93·2	16·13	10·4	14·48
Java ..	E.K. 2	22 months	23–8–22	17·1	15·24	1·03	89·1	13·48	11·6	11·77
Java ..	E.K. 28	22 months	23–8–22	17·6	16·01	·96	90·9	14·52	9·3	12·87
Java ..	100 Bont	22 months	23–8–22	19·6	18·11	·57	92·4	16·00	11·7	14·27
Java ..	247 Generatie ..	22 months	23–8–22	19·6	18·27	·30	93·2	16·17	11·5	14·50
Hawaii ..	H. 146	22 months	23–8–22	20·1	18·97	·16	94·3	16·79	11·5	15·16
Hawaii ..	H. 227	22 months	23–8–22	20·3	18·87	·18	92·9	16·67	11·7	14·91
Mauritius ..	M. 168[04]	22 months	23–8–22	19·8	18·58	·22	93·8	16·56	10·9	15·24
Demerara ..	D. 1135	22 months	23–8–22	19·4	17·67	·65	92·1	15·73	11·0	13·91
India ..	Shahjahanpur No. 10..	22 months	23–8–22	19·1	16·98	·82	88·9	14·68	13·6	12·65
Hambledon, Queensland	H.Q. 77	22 months	23–8–22	19·9	18·77	·27	94·3	16·73	10·9	15·12

The crop results are given below:—

Crop Results of New Canes from Java, Hawaii, Mauritius, and India; also One North Queensland Seedling and D. 1135. Plant Crop—Standover—August, 1922.

Country.	Name or Number of Variety.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
Java	E.K. 1	22 months	54·80	7·93
Java	E.K. 2	22 months	50·68	5·97
Java	E.K. 28	22 months	26·94	3·47
Java	100 Bont	22 months	29·68	4·23
Java	247 Generatie	22 months	32·56	4·72
Hawaii	H. 146	22 months	26·89	4·11
Hawaii	H. 227	22 months	34·27	5·11
Mauritius	M. 168^{04}	22 months	17·08	2·60
Demerara	D. 1135	22 months	36·41	5·06
India	Shahjahanpur No. 10	22 months	35·70	4·52
Hambledon, Queensland	H.Q. 77	22 months	31·37	4·74

The following notes as to the above varieties have been prepared by Mr. Pringle:—

A brief description of these varieties was given in the Report for last year, and the following are a few notes as to the general characteristics of each variety:—

E.K. 1 is a very slow but sure striker, and grows slowly until about 2 feet high, when it commences to grow very rapidly; it has a lodging habit and in a very heavy crop gets badly tangled. The leaf is inclined to cling. It is a good standover cane, there being practically no dead sticks in this crop. It is also a medium to good ratooner, though in this respect is inclined to be shy after a standover crop. It will be seen from the table that this cane has given the highest tonnage per acre, yielding 18·39 tons of cane above D. 1135, the latter being taken as a standard.

E.K. 2 is a vigorous, quick striker and rapid erect grower. The trash falls very freely. It is a fairly good standover cane, but is inclined to throw out aerial shoots, and to die off a little after eighteen months. It is a very good ratooner, spreading out to a big stool in the third crop, but maintains the size of the stick. In tonnage per acre in this crop it gave a yield of 4·12 tons less than E.K. 1, but was 14·27 tons above D. 1135.

E.K. 28 is a good striker and fairly rapid grower of erect habit, the leaf falling very freely, but is a poor standover variety, as there was a large quantity of dead stuff in this crop. It is a fair ratooner and stooler under all conditions. From the table it will be seen that it gave 27·91 tons cane per acre less than E.K. 1, and 9·52 tons cane per acre below D. 1135; this is due to the quantity of dead cane present when cut.

100 Bont is a good striker and medium rapid grower of erect habit, but owing to its delicate tendencies under dry conditions, does not appear to be a suitable cane for this district. It is a good stooler and ratooner, except after a standover crop, when it ratoons badly. It is a fair standover cane, as there was not much dead stuff present when cut. In tonnage per acre it was 6·73 tons less than D. 1135 and 25·12 tons per acre below E.K. 1.

J. 247 Generatie is a fair striker and good erect grower, but the trash clings tightly. It is a fair standover variety, good stooler and ratooner, except after a standover crop, and is not likely to be a favourite in this district. Referring to the table it will be seen that it gave a yield of 3·85 tons per acre less than D. 1135, and was 22·24 tons per acre below E.K. 1.

H. 146 is a good striker and vigorous grower, of erect habit, and practically a self-trasher; is also a good ratooner, but sparse stooler; and inclined to be poor as a standover crop, as there was a considerable quantity of dead cane present when cut. In tonnage per acre it is somewhat light, being 9·52 tons per acre less than D. 1135, and 27·91 tons per acre below E.K. 1.

H. 227 is a good, quick striker, a fairly rapid, erect grower, and a self-trasher. It is also a good standover cane, and stools and ratoons well under all conditions. It is the only variety in this series in which there was no dead cane when cut, and is likely to be a general favourite, as the quality is good, and it is a beautiful cane to handle. In tons per acre it is only 2·14 tons below D. 1125, while the quality in July was 3·57 per cent. c.c.s. higher, and in August 1 per cent. It went 20·53 tons per acre less than E.K. 1.

M. 168^{04} is a good striker but somewhat slow grower of erect habit, and the trash falls freely. It is a very good stooler and ratooner under all conditions, but a very poor standover cane, as there was at least 50 to 60 per cent. of dead cane present when cut, which accounts for the low tonnage, since in tons per acre it produced 19·33 tons less than D. 1135 and 37·72 tons per acre below E.K. 1.

Shahjahanpur No. 10 is a good striker and vigorous grower of fairly erect habit, but will go down under a strong wind, and the trash clings very tightly. It is a good stooler and ratooner under all conditions, and a fairly good standover cane, as there were only a few dead sticks when cut. From the table it will be seen that it yielded only ·71 tons per acre below D. 1135, but 19·10 tons per acre less than E.K. 1.

H.Q. 77 is a good striker under good conditions, but inclined to be poor when the soil is dry. It is a vigorous grower with a lodging habit, the trash falling freely; a good ratooner, but inclined to be sparse in the stool. It is a good standover variety, though it has a tendency

to die off after eighteen months. In tons per acre in this crop it is 5·04 tons per acre below D. 1135 and 23·43 tons per acre less than E.K. 1.

12.—Notes on Eight New Mauritius Varieties.

These varieties were received in fairly good condition on the 11th November, 1920, and carefully examined and planted the same day.

R.P. 6.—This cane germinated well and made rapid growth in the plant crop, and the stool was good. When planted out at the end of last year the strike was again good, and growth vigorous. Judging by the number of sticks in the few stools from which the first lot of plants were cut it appears to be a good ratooner and stooler, while the quality is good. This should prove a promising variety.

R.P. 8.—This variety also germinated well and made rapid growth, while the stool was also good; on being again planted out, it struck well and the growth was quick. It also gave a good ratoon and stooled out well. The quality is inclined to be low.

R.P. 73.—When received this cane, though in a poor condition, germinated well, but the growth since has not been satisfactory, and during the dry weather fell away rapidly. It is of good quality, but does not seem to be a suitable cane for this district, though it may improve as it gets more acclimatised.

33/95.—This cane germinated well and made good growth while the weather was good, but shortly after dry conditions set in it fell away a little. It is a good ratooner and stooler, while the quality is also good.

54/453.—This variety germinated well and made good growth, and stooled out well in the plant crop. It is also a good ratooner, and stands up well under dry conditions. The quality is somewhat on the low side.

64/14.—This cane germinated well when first planted, but the growth was somewhat slow, while the stool in the plant crop was medium. On being again planted out, the same conditions were observed, the ratoons being fair. It appears to be slightly weak under dry conditions, and though the quality is high it is doubtful whether it will come up to the requirements of this district.

131/126.—This variety germinated well and grew quickly in the first plant, but the stool was very sparse. On being planted out the strike was good, but the stool was poor. In the ratoons the stool is very small. It does not seem to be a cane of much value, as the quality is low, and the crop apparently light.

291/08.—When this cane was first planted the germination was good, but the shoots were spindly and yellow in colour. After a few weeks the colour darkened and a vigorous growth commenced, and a very fine stool was produced. On being planted out again the strike was good, but growth somewhat slow, though the stool was good both in the plant and ratoon crops. It appears to be a fairly good cane of high quality.

The following are the results of the analyses of the above canes, made in October:—

Analytical Examination of New Canes from Mauritius—First Ratoon Crop—October, 1922.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
Mauritius	R.P. 6	10 months	25–10–22	21·3	19·12	·34	89·7	17·02	14·93
Mauritius	R.P. 8	10 months	25–10–22	19·8	17·64	·41	89·1	15·70	13·71
Mauritius	R.P. 73	10 months	25–10–22	20·9	18·95	·39	90·6	16·87	14·90
Mauritius	33/95	10 months	25–10–22	20·8	18·39	·36	88·4	16·37	14·34
Mauritius	55/453	10 months	25–10–22	22·8	20·90	·50	91·6	18·70	16·50
Mauritius	64/14	10 months	25–10–22	20·2	18·40	·44	91·1	16·38	14·52
Mauritius	131/126	10 months	25–10–22	20·4	17·28	·82	84·7	15·38	13·00
Mauritius	291/08	10 months	25–10–22	21·8	19·69	·28	90·3	17·53	15·40

13.—Analytical Results of Miscellaneous Canes.

Analyses were made of six miscellaneous canes in October. These comprised some New West Indian canes which were sent from the Mackay Experiment Station, and 7 R. 428, a Fijian Seedling raised by the C.S.R. Company, and N.G. 16, an old New Guinea cane which gives good results in New South Wales.

The results of these analyses appear below:—

Analytical Examination of Six Miscellaneous Canes—Plant Crop—October, 1922.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
Demerara	D. 109	13 months	26–10–22	19·6	17·97	·82	91·6	15·00	14·24
Barbadoes	B. 4030	13 months	26–10–22	20·5	19·30	·34	94·1	17·18	15·50
Barbadoes	B. 4596	13 months	26–10–22	19·2	17·29	·82	90·0	15·39	13·50
Barbadoes	B. 6450	13 months	26–10–22	19·2	18·20	·29	94·7	16·20	14·68
Barbadoes	7 R. 428	13 months	26–10–22	21·2	20·03	·40	94·4	17·83	16·10
New Guinea	N.G. 16	13 months	26–10–22	23·0	21.46	·34	93·3	19·10	17·13

NOTES ON THE MISCELLANEOUS CANES IN ABOVE TABLE.

D. 109.—This cane has done very well on the Station, being a medium striker and good grower. It also stools and ratoons well, the quality being fair. It is hardy under dry conditions.

B. 4030.—Although fairly high in quality this cane does not seem to be suitable for this soil. It is a medium striker and fairly good grower, while the ratoon is good and stool fair, and is also hardy under dry conditions.

B. 4596.—This variety struck fairly well and made rapid growth, while the ratoon is good and stool fair.

B. 6450.—Though of fair quality this cane is far from satisfactory on the Station, since it made a poor strike, and has ratooned badly. It does not appear suitable for this district.

7 R. 428.—This variety has much in its favour, as the germination has been good, and though the growth is inclined to be slow it appears to be a good cropper, as there is a large number of stout sticks in the stool, both in the plant and ratoons. The quality is also good.

New Guinea 16.—Though this cane has done fairly well on this occasion, from its past behaviour one could not recommend it for the red soils. After being cut as a plant crop in 1915 it failed to ratoon, and after planting out again from the nursery it gave a fair plant crop in 1917, and ratooned well, but died out almost completely during the dry weather of 1918 and 1919. It was again brought down from Mackay for a further trial, but so far has not done anything special, though at Bingera it is reported to be doing remarkably well.

The introduction from Mauritius of several new canes took place last year. The following are short descriptions of same. These canes will be planted out and tested in due course:—

BRIEF DESCRIPTION OF NEW CANES FROM MAURITIUS.

M.33/95.—Fairly stout olive-green cane, covered with fairly heavy white wax; nodes 3 to 5 inches long, straight sided; eyes large and fairly prominent, lying in slight groove; foliage broad and plentiful; stick inclined to lodge; good stool; trashes easily.

M.55/453.—Medium thick reddish-green cane, with heavy white wax and longitudinal skin cracks; nodes 4 to 6 inches, slightly zigzag; eyes small and round; foliage fairly broad and plentiful; stick inclined to lodge; stool and ratoon good; trashes easily.

M.64/14.—Thin olive-green to yellow cane, with slight black wax; eyes fairly large, but not prominent; nodes 2 to 4 inches long, straight sided; foliage fairly broad and plentiful; growth upright; stool and ratoon fair; trashes easily.

M.131/126.—Medium thick reddish-black cane, with heavy white wax, which gives it a slightly blue appearance; heavy white rings round nodes, which are 2 to 5 inches long, barrel-shaped and zigzag; eyes large and prominent; foliage fairly narrow and sparse, with deep purple leaf-sheath; stick inclined to lodge; stool good; ratoon fair; trash falls easily.

M.291/08.—Thin reddish-green cane, with heavy white wax; eyes large and full, reposing in groove; nodes 3 to 5 inches long, and slightly barrel-shaped opposite the eye; foliage broad; habit lodging; stool good; trashes easily.

R.P.6.—Medium thick yellowish-green cane, with heavy white rings at nodes; on exposure the stick has brown blotches and slight skin cracks; nodes 2 to 4 inches long, barrel-shaped, and stick has zigzag appearance; eyes large and prominent; foliage broad; stool and ratoon very good; trash falls easily.

R.P.8.—Thin brownish-red cane, with slight white wax; eyes fairly large and prominent; nodes 2 to 4 inches long and straight sided; habit erect; foliage medium width, and fairly plentiful; stool and ratoon good; trashes easily.

R.P.73.—Fairly thick olive-green to yellow cane, with slight white wax and small flat eyes; nodes 2 to 4 inches long and straight sided; habit inclined to lodge; foliage broad and plentiful; stool and ratoon fair; trashes easily.

NEW EXPERIMENTS.

1. Competitive experiments with the following varieties:—

M. 28/10, M. 32/10, M. 55/11, M. 55/1182, B. 4030, B. 4596, B. 6450, 7 R. 428, D. 109, Gingor, Q. 903, Q. 116 Sport, M.Q. 1, M.Q. 2, H.Q. 409, and H.Q. 426 Sport.

Owing to the dry conditions these canes were not sufficiently forward to warrant cutting. They have, therefore, been allowed to stand over.

2. Manurial experiment with Badila or N.G. 15, using a heavy dressing of mixed fertilisers.

Other field trials will be initiated during 1923.

DISTRIBUTION OF VARIETIES.

Free distributions of varieties were made on the 22nd February and 16th August of this year, when upwards of sixty applicants attended at the Station on the former date, and 120 on the latter, while forty-eight bundles were sent to various mills, farmers' associations, and individuals along the lines north and south of Bundaberg, in February, and 212 in August. It is estimated that 10 tons were thus given away on the Station and 13 tons sent to places along the lines, while 26 tons were sold in four or five cwt. lots at £3 per ton. The following varieties were most in demand:—E.K. 1, E.K. 2, E.K. 28, H.Q. 285, Q. 970, Q. 1098, Q. 813, H. 227, H.Q. 77, H. 146, N.G. 81, N.G. 94, N.G. 148, N.G. 164, N.G. 103, J. 247, and Shahjahanpur No. 10.

NEW VARIETIES INTRODUCED TO THE BUNDABERG STATION.

From Java.—S.W. 3, D.I. 52, 90 F, P.O.J. 36, P.O.J. 100, P.O.J. 213, and P.O.J. 2714.

From Hawaii.—H. 456, H. 458, H. 427, H. 1801, H. 5803, and Striped Tip.

From Phillipine.—Luzon 2, Luzon 3, Luzon 4, and Hawaii 27.

The above are being grown in quarantine under permission from the Federal Government.

Field Day.

The Annual Field Day of the Southern Sugar Experiment Station was held on Saturday, the 13th May, when upwards of 260 visitors from Nambour, Yandina, Bauple, Maryborough, Pialba, Childers, Gin Gin, and Bundaberg were present. After the visitors had been welcomed they were shown over the Station, and the various experiments were explained, while an opportunity was given to growers to inspect the different varieties of cane. After luncheon the Director delivered an address, and a demonstration of field implements and tractors during the afternoon concluded a very pleasant and instructive day, the weather being ideal.

Yield of Cane, Southern Sugar Experiment Station.

	Tons	cwt.	qr.
Sent to mill	453	6	3
Sold for plants..	25	15	3
Cut for distribution	23	0	0
Cut for plants	3	0	0
Total	505	2	2

Area from which cut, 30 acres.

Average yield per acre, 16·74 tons.

7.—VARIETIES OF CANE GROWN BY THE SUGAR EXPERIMENT STATIONS SINCE 1893.

Serial Number.	Variety.	Country.	Year Introduced.	Final Result.
1	Mavoe or Mahoaoru	New Guinea	1893	Discarded
2	Chenoma	,,	,,	,,
3	Iduari	,,	,,	,,
4	Arabora	,,	,,	Died out
5	Batoe	,,	,,	Discarded
6	Kikarea	,,	,,	,,
7	Oiva	,,	,,	,,
8	Nave or Mave	,,	,,	,,
9	Moo Moo Oiboku	,,	,,	,,
10	Mabuan	,,	,,	,,
11	Akewa	,,	,,	,,
12	Oraya	,,	,,	,,
13	New Guinea 1	,,	1896	,,
14	,, 2	,,	,,	,,
15	,, 3	,,	,,	,,
16	,, 4	,,	,,	,,
17	,, 4A	,,	,,	,,
18	,, 5	,,	,,	,,
19	,, 6A	,,	,,	,,
20	,, 6B	,,	,,	,,
21	,, 7	,,	,,	,,
22	,, 8A	,,	,,	,,
23	,, 9	,,	,,	,,
24	,, 10	,,	,,	,,
25	,, 11	,,	,,	,,
26	,, 12	,,	,,	,,
27	,, 13	,,	,,	,,
28	,, 14	,,	,,	,,
29	,, 15 (Badila)	,,	,,	Retained
30	,, 16	,,	,,	,,
31	,, 17	,,	,,	Discarded
32	,, 18	,,	,,	,,
33	,, 19	,,	,,	,,
34	,, 20	,,	,,	,,
35	,, 21	,,	,,	,,
36	,, 22 (Mahona)	,,	,,	Retained
37	,, 23	,,	,,	Discarded
38	,, 24 (Goru)	,,	,,	Retained
39	,, 24A (Striped Goru)	,,	,,	,,
40	,, 24B (Green Goru)	,,	,,	,,
41	,, 25	,,	,,	Discarded
42	,, 26	,,	,,	,,
43	,, 27	,,	,,	,,
44	,, 28	,,	,,	,,
45	,, 29	,,	,,	,,
46	,, 30	,,	,,	,,
47	,, 31	,,	,,	,,
48	,, 32	,,	,,	,,
49	,, 33	,,	,,	,,
50	,, 34	,,	,,	,,
51	,, 35	,,	,,	,,
52	,, 36	,,	,,	,,
53	,, 37	,,	,,	,,
54	,, 38	,,	,,	,,
55	,, 39	,,	,,	,,
56	,, 40	,,	,,	,,
57	,, 41	,,	,,	,,
58	,, 42	,,	,,	,,
59	,, 43	,,	,,	,,
60	,, 44	,,	,,	,,
61	,, 45	,,	,,	,,
62	,, 46	,,	,,	,,
63	,, 47	,,	,,	,,
64	,, 48	,,	,,	,,
65	,, 49 (Green Baruma)	,,	,,	,,
66	,, 49 (Red Baruma)	,,	,,	,,
67	,, 50	,,	,,	,,

VARIETIES OF CANE GROWN BY THE SUGAR EXPERIMENT STATIONS SINCE 1893—*continued.*

Serial Number	Variety.	Country.	Year Introduced.	Final Result.
68	New Guinea 51	New Guinea	1896	Discarded
69	,, 52	,,	,,	,,
70	,, 53	,,	,,	,,
71	,, 54	,,	,,	,,
72	,, 55	,,	,,	,,
73	,, 56	,,	,,	,,
74	,, 57	,,	,,	,,
75	,, 58	,,	,,	,,
76	,, 59	,,	,,	,,
77	,, 60	,,	,,	,,
78	,, 61	,,	,,	,,
79	,, 62	,,	,,	,,
80	,, 63	,,	,,	,,
81	,, 64	,,	,,	,,
82	,, 65	,,	,,	,,
83	,, 66	,,	,,	,,
84	Yuban or Uba	South Africa	1901	Retained
85	Meera	,,	1898	,,
86	White Bamboo	,,	,,	Discarded
87	Striped Singapore	,,	,,	Retained
88	Rose Bamboo Rappoe	,,	,,	,,
89	Bourbon	Mauritius	,,	Died out
90	Louisiana Striped	Louisiana	1902	Discarded
91	Louisiana Tiboo Merd	,,	,,	,,
92	Demerara 74	Demerara	,,	,,
93	,, 95	,,	,,	,,
94	Trinidad Seedling 60	Trinidad	,,	,,
95	,, 83	,,	,,	,,
96	,, 202	,,	,,	,,
97	,, 205	,,	,,	,,
98	Mauritius Borneo	Mauritius	1903	,,
99	,, Galogo C.	,,	,,	,,
100	,, Bambou Rouge	,,	,,	,,
101	,, Louzier Rouge	,,	,,	,,
102	,, Tamarin	,,	,,	,,
103	,, Settlers	,,	,,	,,
104	Barbadoes 208	Barbadoes	,,	,,
105	S.A. 1	South Africa	1905	,,
106	,, 2	,,	,,	,,
107	Hambledon, Queensland 5	Queensland	1906	Retained
108	,, 10	,,	,,	,,
109	,, 11	,,	,,	Discarded
110	,, 62	,,	,,	,,
111	,, 114	,,	,,	Retained
112	,, 172	,,	,,	Discarded
113	,, 222	,,	,,	Retained
114	,, 243	,,	,,	Discarded
115	,, 285	,,	,,	Retained
116	,, 297	,,	,,	Discarded
117	White Mexican	Hawaii	,,	Died out
118	Queensland 6	Queensland	1908	Discarded
119	,, 30	,,	,,	,,
120	,, 102	,,	,,	,,
121	,, 116	,,	,,	Retained
122	,, 121	,,	,,	Discarded
123	,, 176	,,	,,	,,
124	Barbadoes 147	Barbadoes	,,	Retained
125	Mauritius Malagache	Mauritius	,,	,,
126	,, 1900 Seedling	,,	1909	,,
127	Hambledon, Queensland 426	Queensland	,,	,,
128	,, 458	,,	,,	,,
129	Mauritius 189	Mauritius	,,	,,
130	Couve	,,	,,	Discarded
131	Mauritius 55	,,	,,	Retained
132	,, 87	,,	,,	,,
133	,, 89	,,	,,	,,
134	,, 779	,,	,,	Discarded
135	,, 998	,,	,,	,,
136	,, 1022	,,	,,	,,
137	,, 1201	,,	,,	Died out
138	,, 1237	,,	,,	,,
139	,, 1474	,,	,,	Discarded
140	Louisiana Striped	Louisiana	1910	,,
141	,, Purple	,,	,,	,,
142	Demerara 117	Demerara	,,	Died out
143	,, 604	,,	,,	,,
144	Trinidad 211	Trinidad	,,	Discarded
145	Queensland 8	Queensland	,,	Died out
146	,, 25	,,	,,	,,
147	,, 30	,,	,,	,,
148	,, 45	,,	,,	,,
149	,, 58	,,	,,	Discarded
150	,, 59	,,	,,	,,
151	,, 64	,,	,,	Died out
152	,, 65	,,	,,	,,
153	,, 80	,,	,,	,,
154	,, 102	,,	,,	Discarded

VARIETIES OF CANE GROWN BY THE SUGAR EXPERIMENT STATIONS SINCE 1893—*continued.*

Serial Number.	Variety.	Country.	Year Introduced.	Final Result.
155	Queensland 103	Queensland	1910	Died out
156	,, 112	,,	,,	,,
157	,, 115	,,	,,	,,
158	,, 116	,,	,,	Retained
159	,, 121	,,	,,	Discarded
160	,, 126	,,	,,	Died out
161	,, 135	,,	,,	Retained
162	,, 137	,,	,,	,,
163	,, 153	,,	,,	Died out
164	,, 162	,,	,,	,,
165	,, 285	,,	,,	,,
166	,, 286	,,	,,	Discarded
167	,, 303	,,	,,	,,
168	,, 307	,,	,,	,,
169	,, 328	,,	,,	,,
170	,, 363	,,	,,	Died out
171	,, 365	,,	,,	Discarded
172	,, 422	,,	,,	Died out
173	,, 430	,,	,,	,,
174	,, 437	,,	,,	Discarded
175	,, 452	,,	,,	,,
176	,, 554	,,	,,	,,
177	,, 558	,,	,,	,,
178	,, 682	,,	,,	Died out
179	,, 684	,,	,,	Discarded
180	,, 694	,,	,,	,,
181	,, 695	,,	,,	Retained
182	,, 698	,,	,,	Discarded
183	,, 704	,,	,,	Died out
184	,, 717	,,	,,	,,
185	, 719	,,	,,	Discarded
186	,, 721	,,	,,	,,
187	,, 745	,,	,,	Retained
188	,, 747	,,	,,	Discarded
189	,, 748	,,	,,	,,
190	,, 750	,,	,,	,,
191	,, 763	,,	,,	,,
192	,, 764	,,	,,	Died out
193	,, 767	,,	,,	Discarded
194	,, 768	,,	,,	,,
195	,, 777	,,	,,	Died out
196	,, 779	,,	,,	Retained
197	,, 787	,,	,,	Died out
198	,, 792	,,	,,	Discarded
199	,, 793	,,	,,	Died out
200	,, 794	,,	,,	,,
201	,, 795	,,	,,	Discarded
202	,, 803	,,	,,	Died out
203	,, 811	,,	,,	Discarded
204	,, 812A	,,	,,	Retained
205	,, 813	,,	,,	,,
206	,, 815	,,	,,	Discarded
207	,, 820	,,	,,	,,
208	,, 822	,,	,,	Retained
209	,, 830	,,	,	Died out
210	,, 840	,,	,,	Discarded
211	,, 849	,,	,,	,,
212	,, 854	,,	,,	Died out
213	,, 855	,,	,,	Retained
214	,, 865	,,	,,	Died out
215	,, 866	,,	,,	,,
216	,, 881	,,	,,	Discarded
217	,, 884	,,	,,	,,
218	,, 886	,,	,,	Died out
219	,, 887	,,	,,	Discarded
220	,, 889	,,	,,	,,
221	,, 891	,,	,,	,,
222	,, 899	,,	,,	,,
223	,, 900	,,	,,	,,
224	,, 903	,,	,,	Retained
225	,, 918	,,	,,	Discarded
226	,, 928	,,	,,	,,
227	,, 962	,,	,,	,,
228	,, 970	,,	,,	Retained
229	,, 976	,,	,,	Died out
230	,, 977	,,	,,	Discarded
231	,, 979	,,	,,	,,
232	,, 992	,,	,,	,,
233	,, 995	,,	,,	,,
234	,, 997	,,	,,	,,
235	,, 999	,,	,,	,,
236	,, 1001	,,	,,	,,
237	,, 1004	,,	,,	,,
238	,, 1009	,,	,,	,,
239	,, 1013	,,	,,	,,
240	,, 1019	,,	,,	,,
241	,, 1023	,,	,,	,,

VARIETIES OF CANE GROWN BY THE SUGAR EXPERIMENT STATIONS SINCE 1893—*continued.*

Serial Number.	Variety.	Country.	Year Introduced.	Final Result.
242	Queensland 1025	Queensland	1910	Discarded
243	„ 1035	„	„	„
244	„ 1046	„	„	„
245	„ 1048	„	„	„
246	„ 1049	„	„	„
247	„ 1052	„	„	„
248	„ 1070	„	„	Died out
249	„ 1071	„	„	Discarded
250	„ 1074	„	„	„
251	„ 1078	„	„	„
252	„ 1079	„	„	„
253	„ 1084	„	„	„
254	„ 1086	„	„	„
255	„ 1092	„	„	Retained
256	„ 1095	„	„	Discarded
257	„ 1098	„	„	Retained
258	„ 1102	„	„	Discarded
259	„ 1103	„	„	„
260	„ 1108	„	„	„
261	„ 1110	„	„	„
262	„ 1112	„	„	„
263	„ 1113	„	„	„
264	„ 1115	„	„	„
265	„ 1121	„	„	Retained
266	„ 1133	„	„	„
267	Barbadoes 176	Barbadoes	„	Discarded
268	„ 224	„	„	„
269	„ 1529	„	„	„
270	„ 3412	„	„	„
271	„ 3747	„	„	Retained
272	„ 3922	„	„	„
273	„ 6450	„	„	Died out
274	Demerara 115	Demerara	„	Retained
275	„ 145	„	„	Discarded
276	„ 306	„	„	„
277	„ 1135	„	„	Retained
278	„ 1483	„	„	Discarded
279	Badila Seedling	Queensland	„	Retained
280	Hybrid No. 1	„	„	„
281	Cassilis	„	„	„
282	Malabar	Mauritius	„	„
283	Otamite	„	„	„
284	Cheribon	„	„	„
285	Gingila	Queensland	„	Discarded
286	Petite Senneville	Mauritius	1912	Retained
287	N.G. 67	New Guinea	„	Discarded
288	„ 68	„	„	„
289	„ 69	„	„	„
290	„ 70	„	„	„
291	„ 71	„	„	„
292	„ 72	„	„	„
293	„ 73	„	„	„
294	„ 74	„	„	„
295	„ 75	„	„	„
296	„ 76	„	„	„
297	„ 77	„	„	„
298	„ 78	„	„	„
299	„ 79	„	„	„
300	„ 80	„	„	„
301	„ 81	„	1912	Retained
302	„ 82	„	„	Discarded
303	„ 83	„	„	„
304	„ 84	„	„	„
305	„ 85	„	„	„
306	„ 86	„	„	„
307	„ 87	„	„	„
308	„ 88	„	„	Retained
309	„ 89	„	„	„
310	„ 90	„	„	„
311	„ 91	„	„	Discarded
312	„ 92	„	„	„
313	„ 93	„	„	„
314	„ 94	„	„	Retained
315	„ 95	„	„	Discarded
316	„ 96	„	„	„
317	„ 97	„	„	„
318	„ 98	„	„	„
319	„ 99	„	„	„
320	„ 100	„	„	„
321	„ 101	„	„	„
322	„ 102	„	„	Retained
323	„ 103	„	„	„
324	„ 104	„	„	Discarded
325	„ 105	„	„	„
326	„ 106	„	„	„
327	„ 107	„	„	„
328	„ 108	„	„	„

VARIETIES OF CANE GROWN BY THE SUGAR EXPERIMENT STATIONS SINCE 1893—*continued.*

Serial Number	Variety.	Country.	Year Introduced.	Final Result.
329	N.G. 109	New Guinea	1912	Discarded
330	,, 110	,,	,,	,,
331	,, 111	,,	,,	,,
332	,, 112	,,	,,	,,
333	,, 113	,,	,,	,,
334	,, 114	,,	,,	,,
335	,, 115	,,	,,	,,
336	,, 116	,,	,,	,,
337	,, 117	,,	,,	,,
338	,, 118	,,	,,	,,
339	,, 119	,,	,,	,,
340	,, 120	,,	,,	,,
341	,, 121	,,	,,	,,
342	,, 122	,,	,,	,,
343	,, 123	,,	,,	,,
344	,, 124	,,	,,	,,
345	,, 125	,,	,,	,,
346	,, 126	,,	,,	,,
347	,, 127	,,	,,	,,
348	,, 128	,,	,,	,,
349	,, 129	,,	,,	,,
350	,, 130	,,	,,	,,
351	,, 131	,,	,,	,,
352	,, 132	,,	,,	,,
353	,, 133	,,	,,	,,
354	,, 134	,,	,,	,,
355	,, 135	,,	,,	,,
356	,, 136	,,	,,	,,
357	,, 137	,,	,,	,,
358	,, 138	,,	,,	,,
359	, 139	,,	,,	,,
360	,, 140	,,	,,	,,
361	,, 141	,,	,,	,,
362	,, 142	,,	,,	,,
363	,, 143	,,	,,	,,
364	,, 144	,,	,,	,,
365	,, 145	,,	,,	,,
366	,, 146	,,	,,	,,
367	,, 147	,,	,,	,,
368	,, 148	,,	,,	Retained
369	,, 149	,,	,,	Discarded
370	,, 150	,,	,,	,,
371	,, 151	,,	,,	,,
372	,, 152	,,	,,	,,
373	,, 153	,,	,,	,,
374	,, 154	,,	,,	,,
375	,, 155	,,	,,	,,
376	,, 156	,,	,,	,,
377	,, 157	,,	,,	,,
378	,, 158	,,	,,	,,
379	,, 159	,,	,,	,,
380	,, 160	,,	,,	,,
381	,, 161	,,	,,	,,
382	,, 162	,,	,,	,,
383	,, 163	,,	,,	,,
384	,, 164	,,	,,	Retained
385	,, 165	,,	,,	Discarded
386	,, 166	,,	,,	,,
387	,, 167	,,	,,	,,
388	,, 168	,,	,,	,,
389	,, 169	,,	,,	,,
390	,, 170	,,	,,	,,
391	,, 171	,,	,,	,,
392	,, 172	,,	,,	,,
393	,, 173	,,	,,	,,
394	,, 174	,,	,,	,,
395	,, 175	,,	,,	,,
396	,, 176	,,	,,	,,
397	,, 177	,,	,,	,,
398	,, 178	,,	,,	,,
399	,, 179	,,	,,	,,
400	,, 180	,,	,,	,,
401	,, 181	,,	,,	,,
402	,, 182	,,	,,	,,
403	,, 183	,,	,,	,,
404	,, 184	,,	,,	,,
405	,, 185	,,	,,	,,
406	Gingraya	Queensland	1914	Retained
407	Gingor	,,	,,	,,
408	Shahjahanpur No. 10	India	1915	,,
409	M. 15^{04}	Mauritius	1916	Discarded
410	M. 29^{04}	,,	,,	,,
411	M. 168^{04}	,,	,,	Retained
412	M. 222^{04}	,,	,,	Discarded
413	J. E.K.^{1}	Java	,,	Retained
414	J. E.K.^{2}	,,	,,	,,
415	J. E.K.^{28}	,,	,,	,,

VARIETIES OF CANE GROWN BY THE SUGAR EXPERIMENT STATIONS SINCE 1893—*continued.*

Serial Number.	Variety.	Country.	Year Introduced.	Final Result.
416	J. 100 Bont	Java	1916	Retained
417	J. 247 Generatie	,,	,,	,,
418	8 R. 431	Fiji	,,	,,
419	7 R. 428	,,	,,	,,
420	Mossman, Queensland, No. 1	Queensland	,,	,,
421	H. 109	Hawaii	1917	,,
422	H. 146	,,	,,	,,
423	H. 227	,,	,,	,,
424	H.Q. 77	Queensland	,,	,,
425	B. 4030	Barbadoes	,,	Under examination
426	B. 6450	,,	,,	,, ,,
427	B. 254	,,	,,	Died out
428	B. 4596	,,	,,	Under examination
429	B. 6204	,,	,,	Died out
430	B. 4934	,,	,,	,,
431	D. 109	Demerara	,,	Under examination
432	Oba Badila	New Guinea	1918	Retained
433	7 R. 96	Fiji	,,	Destroyed by flood waters
434	Mossman, Queensland, No. 2	Queensland	,,	Under examination
435	Mauritius 32^{10}	Mauritius	1919	,, ,,
436	,, 28^{10}	,,	,,	,, ,,
437	,, 131^{168}	,,	,,	,, ,,
438	,, 55^{1182}	,,	,,	,, ,,
439	,, 55^{11}	,,	,,	,, ,,
440	Mossman, Queensland, No. 3	Queensland	1921	,, ,,
441	,, No. 4	,,	,,	,, ,,
442	,, No. 5	,,	,,	,, ,,
443	,, No. 6	,,	,,	,, ,,
444	,, No. 7	,,	,,	,, ,,
445	Barbadoes 156	Barbadoes	,,	,, ,,
446	Mauritius 64/14	Mauritius	,,	,, ,,
447	,, 55/143	,,	,,	,, ,,
448	,, 219/58	,,	,,	,, ,,
449	,, 33/95	,,	,,	,, ,,
450	,, 131/126	,,	,,	,, ,,
451	,, R.P. 6	,,	,,	,, ,,
452	,, R.P. 8	,,	,,	,, ,,
453	,, R.P. 73	,,	,,	,, ,,

CANES DISTRIBUTED FROM THE SUGAR EXPERIMENT STATIONS.

Name or Number of Variety.	Commercial Cane Sugar.
New Guinea 15 (Badila)	18·85
,, 16	15·10
,, 22	16·00
,, 24 (Goru)	16·40
,, 24A (Striped Goru)	15·81
,, 24B (Green Goru)	15·70
,, 40	14·00
,, 38	13·62
,, 47	13·90
,, 48	14·00
,, 54	14·93
Malagache	15·00
B. 147	17·20
B. 208	18·50
Q. 116	14·50
H.Q. 5	13·50
,, 10	15·00
,, 77	14·30
,, 114	14·00
,, 222	14·00
,, 285	15·16
,, 426	18·00
,, 458	13·80
Mauritius 55	13·50
,, 87	14·00
,, 89	13·00
Queensland 135	15·00
,, 695	13·80
,, 855	15·00
,, 812A	15·00
,, 813	16·70
,, 903	16·0
,, 970	16·2
,, 1001	14·5
,, 1092	14·0

CANE DISTRIBUTED FROM THE SUGAR EXPERIMENT STATIONS—*continued.*

Name or Number of Variety.	Commercial Cane Sugar.
Queensland 1098	15·6
,, 1121	15·1
,, 1133	13·5
Badila Seedling	17·2
Hybrid No. 1	16·1
New Guinea 81	14·9
,, 83	15·0
,, 88	13·5
,, 89	14·7
,, 103	15·1
,, 130	13·0
Shahjahanpur No. 10	15·0
Tableland Badila	18·0
,, Goru	16·0
,, Rose Bamboo	15·5
,, Striped Singapore	15·3
,, Meera	14·5
Mauritius 168^{04}	16·3
Petite Senneville	14·0
7 R. 428	13·9
H. 109	15·0
H. 146	15·5
H. 227	14·7
Java E.K.[1]	16·5
,, E.K.[2]	15·7
,, E.K.[28]	16·7
,, 247	15·4
,, 100 Bont	13·5
Mossman No. 1	15·8
Gingor	16·2
D. 1457	15·6
Q. 116 Sport	14·5
1900 Seedling	16·0
D. 1135	14·5
Gingila	14·8

8.—WORK OF THE LABORATORIES.

The amount of chemical data appearing in this Report comprises only a small part of the analytical work carried out by the Sugar Experiment Station Laboratories. Soil tests, fertiliser analyses, and other agricultural analyses are made free for growers. In addition to this large numbers of sugar-cane analyses are carried out every year free for cane growers. This year 1,013 cane juices were analysed at the Bundaberg Sugar Experiment Station, about 873 being for outside growers.

A large number of soil, fertiliser, and other analyses are made for the Bureau at the Agricultural Laboratory in Brisbane, where a member of the staff is located.

Thanks are due to Mr. Brünnich, the Agricultural Chemist, for the prompt manner in which results are furnished.

The amount of analytical work performed in the different laboratories is set out in the accompanying tables.

CANE AND JUICE ANALYSES CARRIED OUT AT THE SOUTHERN SUGAR EXPERIMENT STATION, BUNDABERG, SEASON 1922.

Materials.	No. of Analyses.
Sugar-canes and juices for growers ..	532
Sugar-canes and juices for Agricultural Show, Bundaberg	97
Sugar-canes and juices for Agricultural Show, Gin Gin	231
Sugar-canes and juices for Agricultural Show, Maryborough	13
Sugar-canes and juices for Experiment Station	140
Sugar-cane fibres for Experiment Station	4
Total	1,017

DETAILED REPORT OF ANALYTICAL WORK PERFORMED BY THE LABORATORY OF THE SUGAR EXPERIMENT STATION, MACKAY, FOR THE SEASON 1921-22.

Materials.	No. of Analyses.
Sugar-canes for farmers	327
Sugar canes for Mackay show	39
Sugar-canes for Experiment Station ..	230
Sugar-cane fibres	43
Limestones	9
Fertilisers	5
Waters	2
Soils for farmers	8
Milks for Mackay show	14
Total	677

DETAILED REPORT OF ANALYTICAL WORK PERFORMED BY THE LABORATORY OF THE SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE FOR THE SEASON 1921 1922.

Materials.	No. of Analyses.
Mixed fertilisers	6
Lime	1
Lime earth	1
Raw sugars	1
Cane fibres	7
Soils	6
Sugar-cane juices for station	160
Sugar-cane juices for farmers	7
Miscellaneous	5
Total	194

ANALYSES CARRIED OUT FOR THE BUREAU OF SUGAR EXPERIMENT STATIONS AT THE AGRICULTURAL LABORATORY, BRISBANE.

Materials.	No. of Analyses.
Soils	82
Wood ashes	3
Limestone, &c.	4
Fertilisers	5
Waters	2
Sugar-canes	4
Molasses	2
Total	102

COMPARATIVE RESULTS OF ANALYSES MADE AT RACECOURSE MILL WITH ANALYSES OF JUICE EXPRESSED BY THE LABORATORY MILL AT THE SUGAR EXPERIMENT STATION, MACKAY, FROM THE SAME VARIETIES OF CANE.

In order to get some information as to the average difference between the juice expressed at the first rollers of a large sugar mill and juice expressed by a laboratory mill from the same varieties of cane, a large number of samples have been compared. The laboratory mill at this station is a powerful one, having rollers of $6\frac{3}{4}$ inches diameter, which can be adjusted to crush light or heavy. The analyses given in the accompanying table under laboratory mill results are the final analyses made on the experiment varieties under test. The samples varied in weight from about 28 lb. to 150 lb. of cane, and were only passed through the rollers once. The probable extraction would be between 25 per cent. and 35 per cent.; by crushing the cane twice an extraction of 51 per cent. can be obtained, and the maximum is approximately 72 per cent., which was obtained by passing the cane through five or six times. The samples taken at Racecourse Mill were from the same varieties off the same divisions of land. The cane was harvested, and the analyses were made at Racecourse Mill within about five days of the time the tests were made at the station. The greatest difference between any two results is 1·74 c.c.s., and no other differences exceeded 1·0 per cent. These wide variations are, no doubt, due to slight differences of sample, and the same applies to the four instances where the mill results are slightly higher than the laboratory results. The average difference of thirty-four samples is ·47 per cent., and this completely bears out the previous experiments as published in the 1920 report, where the same canes were crushed six times and each sample of juice collected and analysed separately. The 1920 experiment showed that the cane juice does not vary greatly with increased extraction, and the true average c.c.s. was only slightly lower than that of the first juice expressed. It should also be noted that in the 1920 experiments the extractions of the final crushings and the weight of juice expressed were low as compared with the total juice.

COMPARATIVE RESULTS OF ANALYSES MADE AT RACECOURSE MILL, WITH ANALYSES MADE OF JUICE EXPRESSED BY LABORATORY MILL FROM THE SAME VARIETIES OF CANE.

Variety.	Laboratory Mill Results.				Racecourse Mill Results.				Difference in C.C.S.
	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.	% Total Solids (Brix).	% Sucrose in Juice.	% C.C.S. in Cane.	Purity of Juice.	
Q. 970 (first ratoons)	21·9	20·61	16·15	94·1	21·1	20·05	15·8	95·0	·35
Q. 970 (first ratoons)	21·7	20·50	16·10	94·5	21·4	19·75	15·3	92·3	·80
Q. 970 (first ratoons)	21·6	20·23	15·81	93·6	21·0	20·0	15·78	95·2	·03
Q. 970 (first ratoons)	21·9	20·26	15·72	92·5	21·2	19·85	15·47	93·6	·25
Q. 1098 (plant)	19·5	18·21	14·56	93·4	19·0	17·48	13·85	92·0	·71
7 R. 428 (plant)	19·1	17·58	13·95	92·0	18·8	17·19	13·57	91·4	·38
Q. 1121 (plant)	19·6	18·47	14·84	94·2	19·9	18·5	14·75	92·9	·09
Q. 813 (plant)	21·3	19·97	15·81	93·7	21·1	19·74	15·60	93·5	·21
N.G. 24A (Goru)	19·6	18·13	14·68	92·5	20·2	18·44	14·3	91·3	·38
Shahjahanpur	20·6	19·37	14·22	94·0	20·9	19·11	13·79	91·4	·43
H.Q. 77 (plant)	19·6	18·61	14·93	94·9	19·7	18·27	14·55	92·8	·38
M. 168[04] (plant)	18·4	16·84	13·3	91·5	18·5	16·48	12·71	89·1	·59
Java E.K. 28 (plant)	20·8	19·89	15·83	95·6	22·4	20·25	15·58	90·4	·25
Java E.K. 2 (plant)	16·8	14·71	11·03	87·5	18·0	15·45	11·44	85·8	·31 higher
Java E.K. 1 (plant)	18·6	16·87	12·86	90·7	18·3	17·12	13·26	93·5	·40 higher
Java 247 (plant)	18·8	18·0	13·67	95·7	19·3	17·55	12·9	90·9	·77
Java 100 Bont (plant)	17·8	15·95	12·22	89·6	18·5	16·03	12·0	86·6	·22
H. 109 (plant)	19·3	18·64	14·73	96·5	20·75	19·26	14·88	93·0	·15 higher
H. 146 (plant)	19·5	18·61	14·97	95·4	20·2	18·10	14·05	89·6	·92
H. 227 (plant)	19·7	18·61	14·89	94·4	20·0	17·97	14·13	89·8	·76
D. 1457 (first ratoons)	21·2	20·01	16·48	94·4	21·8	19·69	15·78	90·3	·70
D. 109 (first ratoons)	19·2	18·11	14·47	94·3	18·9	16·64	12·73	88·0	1·74
B. 4596 (first ratoons)	17·5	16·19	12·49	92·5	17·8	16·01	12·12	90·0	·37
B. 6450 (first ratoons)	20·4	19·63	15·58	96·2	20·4	19·44	15·33	95·3	·25
Gingor (first ratoons)	20·3	19·36	15·76	95·3	..	..	15·05	..	·71
7 R. 428 (first ratoons)	20·2	18·62	14·6	92·2	..	..	14·40	..	·20
H.Q. 458 (first ratoons)	19·9	18·59	15·13	93·4	..	..	15·65	..	·52 higher
Q. 813 (first ratoons)	21·8	21·1	17·0	96·8	..	..	16·0	..	1·0
Q. 903 (first ratoons)	20·5	19·74	15·67	96·3	..	..	14·9	..	·77
Q. 1098 (first ratoons)	20·6	19·59	15·54	95·1	..	..	14·6	..	·94
Q. 1121 (first ratoons)	20·7	20·03	15·94	96·7	..	..	15·2	..	·74
Q. 970 (first ratoons)	21·3	20·41	16·26	96·1	..	..	15·7	..	·56
N.G. 24B Goru (second ratoons)	20·4	19·26	15·50	94·4	..	..	14·8	..	·70
N.G. 24B Goru (second ratoons)	21·4	19·92	15·61	93·0	..	..	14·8	..	·81
Average C.C.S. 34 samples	..	..	14·88	..	Average C.C.S.		14·41	Average	·47

For the information of those interested, the results of the 1920 experiments are also given.

"TESTS TO DETERMINE THE EFFECT ON THE QUALITY OF JUICE BY INCREASING THE EXTRACTION.

Variety of Cane.	Percentage of Juice expressed on 100 of Juice.	Total Solids (Brix).	% Sucrose in Juice.	C.C.S. in Cane.	Purity of Juice.
N.G. 24B (Plant)	First crushing	16·09	19·3	17·74	14·06	91·9
Ditto	Second crushing	24·42	19·1	17·52	13·86	91·7
Ditto	Third crushing	14·37	19·2	17·63	13·95	91·8
Ditto	Fourth crushing	8·62	19·8	18·20	14·41	91·9
Ditto	Fifth crushing	5·75	19·6	17·30	13·37	88·3
Ditto	Sixth crushing	1·15	20·3	17·70	13·57	87·2
Total Extraction		70·40	..	..	..	..
True Average C.C.S. in Cane		..	..	..	13·95	..
N.G. 24A (First Ratoons)	First crushing	5·21	20·3	18·99	15·02	93·5
Ditto	Second crushing	19·03	19·9	18·77	14·90	94·3
Ditto	Third crushing	19·03	19·9	18·75	14·89	94·2
Ditto	Fourth crushing	14·60	19·8	18·65	14·80	94·2
Ditto	Fifth crushing	10·69	20·4	18·88	14·84	92·5
Ditto	Sixth crushing	3·12	20·4	18·72	14·63	91·8
Total Extraction		71·68	..	..	..	..
True Average C.C.S. in Cane		..	..	..	14·86	..
H.Q. 426 (First Ratoons)	First crushing	5·66	21·6	20·26	16·23	93·7
Ditto	Second crushing	10·86	21·1	19·52	15·52	92·5
Ditto	Third crushing	16·98	21·1	19·49	15·48	92·4
Ditto	Fourth crushing	12·27	21·0	19·41	15·42	92·4
Ditto	Fifth crushing	6·61	21·2	19·41	15·34	91·5
Ditto	Sixth crushing	5·66	21·6	19·66	15·48	91·0
Total Extraction		58·04	..	..	..	..
True Average C.C.S. in Cane		..	..	..	15·53	..

"Mr. Keogh comments:—'In the preceding tables the percentage of juice expressed is the amount expressed at each crushing. In the first crushing the rollers were well opened and the cane only lightly cracked; the second crushing the rollers were screwed down lower and the cane crushed lightly; the third time the rollers were screwed well down and the cane got a good crushing; the fourth time the rollers were almost down as far as possible; the fifth, the rollers were the same as the previous time, but the cane was put through one stick on top of another; and the final crushing the rollers were screwed down as far as possible, and two sticks were put through at a time one on top of another. In the first and second tables the extraction is shown as 70.4 and 71.68 respectively, in each case no more juice could be expressed, and the maximum extraction on the laboratory rollers was obtained without maceration. At each crushing the juice was weighed, well mixed, and a sample taken for analysis. With the Clark's Seedling, the extraction obtained was not very high; owing to the brittle nature of the cane it broke up into very small pieces. It will be noticed that the juice from the first three crushings is only slightly higher than the true average c.c.s., and that from the final crushings is slightly lower. For the first sample 97 lb. of cane were taken, the second sample 54¼ lb., and the third sample 59½ lb. of cane.'

"2. The second experiment was the comparison of the analysis of laboratory mill juice with juice from the same variety and field crushed by the first mill of a large sugar factory.

Comparative Results of Analyses of Juice from Laboratory Mill and Juice from First Mill of Sugar Factory.

Variety of Cane.	Laboratory Mill Results.				First Rollers of Sugar Mill.			
	Total Soluble Solids (Brix).	Sucrose in Juice.	Quotient of Purity.	C.C.S. in Cane.	Total Soluble Solids (Brix).	Sucrose in Juice.	Quotient of Purity.	C.C.S. in Cane.
Q. 1092 (Plant)	18·7	16·37	87·5	12·59	18·6	16·27	87·4	12·48
H.Q. 458 (Plant)	18·9	16·61	87·8	12·80	19·17	17·13	89·3	13·37
H.Q. 458 (First Ratoons)	19·4	17·38	89·6	13·55	20·06	17·56	87·5	13·50
Q. 1121 (First Ratoons)	20·0	18·61	93·0	14·80	19·17	17·40	90·7	13·70
N.G. 24B (Plant—Goru)	19·2	17·63	91·8	13·95	19·47	17·37	89·2	13·51
Average C.C.S.	..	..	..	13·54	Average C.C.S.			13·31

"In the above tests the cane for the laboratory sample was picked from the field after the cane was cut for sending to the mill. In all cases twenty average-sized sticks were selected, and the cane passed through the rollers twice; the first crushing was light, and in the second the rollers were screwed well down; the crushings as given to these samples would express about 40 per cent. of the juice; the maximum extraction obtainable on this small mill is approximately 72 per cent.; this was determined by actual tests in another set of experiments.

"The tests of the sugar-mill were made on the same varieties and on the same cane from which the small samples of twenty sticks were selected. The cane was loaded into wagons after the small samples were selected, and then sent to Racecourse Mill, where the wagon loads were passed through the first rollers and the samples taken for comparison."

9.—WORK OF THE DIVISION OF ENTOMOLOGY.

This very important branch of the sugar experiment station work is in the capable hands of Mr. Edmund Jarvis, whose monthly reports are read with the greatest interest by cane-growers. Mr. Jarvis has done an immense amount of useful work for the cane farmer, and he is assisted by Mr. Cottrell Dormer, whose work is well spoken of by the Entomologist. It is proposed to appoint another assistant as early as possible.

The following is the annual report of the entomologist in charge:—

ANNUAL REPORT OF ENTOMOLOGIST,
1921-1922.

To the Director,

Bureau of Sugar Experiment Stations.

Sir,—With regard to the activities of the Division of Entomology during the year ending October, 1922, I have the honour to submit the following report.

You are aware that the work of this laboratory is practically confined to the study of injurious cane-insects and their control, our efforts being directed primarily against the so-called "grey-back" cockchafer (*Lepidoderma albohirtum*, Waterh.).

The beetle-borer of cane (*Rhabdocnemis obscurus*, Boisd.), although of secondary economic importance, appears to be on the increase, and at the present time is causing serious losses in many localities.

These two insects, together with a small brown cockchafer, commonly known as the Frenchi beetle (*Lepidiota frenchi*, Blackb.), and the Large Moth-borer (*Phragmatiphila truncata*, Walk.), are responsible for most of the damage to sugar-cane in North Queensland.

Experimentation during the past year has included the following methods of control, directed against the various life-cycle stages of albohirtum:—

Eggs.—Fumigation with carbon bisulphide.
Larvæ.—Soil fumigants, both solid and liquid forms; soil repellants; larvicidal solutions; entomogenous fungi; bacterial diseases; poison baits; trap crops, &c. *Pupæ.*—Fumigation with carbon bisulphide. *Beetles.*—Attractive aromas; light-traps; trap-trees; arsenical poisoning of favourite feeding-trees.

In the hopes of controlling our large moth-borer in districts, such as the Lower Burdekin, where caterpillars of this pest occasion serious damage each year to young ratoon and plant-cane, the breeding of its chief

10.—SUGAR CANES, SEEDLINGS, CANES AT KAIRI STATE FARM, &c.

Some time ago application was made to the different sugar-growing countries of the world for new canes of promise. So far we have received the following:—

(*a*) *From Java.*—S.W. 3, 90 F., D.I. 52, 213 P.O.J., 100 P.O.J., 36 P.O.J., 2714 P.O.J.

The Assistant Director of the Proefstation, Java, states that 36 P.O.J. is said to be frost resistant in Argentine.

(*b*) *From Hawaii.*—H. 456, H. 458, H. 472, H. 1801, H. 5803, Striped Tip.

In a letter from the Director of the Hawaiian Experiment Station he says: "We are sending you several of our seedling canes which we are following with some interest. We also include the Striped Tip variety of cane which is widely grown in upper lands in districts of heavy rainfall. This cane is liked on account of its vigorous qualities resulting in low cultivation expenses."

(*c*) *From the Philippine Islands.*—Luzon 1, Luzon 2, Luzon 3, Luzon 4, Hawaii 27, Yellow Caledonia.

On arrival it was found that Luzon 1 and Yellow Caledonia had died in transit.

The Q. 813 cane mentioned last year has made further progress. At Proserpine it was reported that this cane has proved itself eminently suitable for that district. Favourable reports have also been received from other districts.

The following analyses of new varieties at Mossman will prove interesting. The majority of these were supplied by the Sugar Experiment Stations:—

Analyses of Cane from Crees Bros.' Nursery, Booroondara Farm, Mossman. Plant Cane, Eleven Months Old.

Variety.	Length of Stick.	Weight of Stick.	Brix.	% C.S.	Q. Purity.	% C.C.S.	Lbs. C.C.S. in Stick.	Tons cane per ton 94 N.T.
	Ft. in.							
H.Q. 426	5 0	3·00	23·27	21·70	93·25	17·12	·5136	6·49
N.G. 190	5 0	3·75	23·07	21·22	91·98	16·61	·6229	6·69
N.G. 241	6 9	5·75	21·6	19·74	91·39	15·39	·8849	7·22
E.K. 28	7 6	6·00	21·0	18·86	89·81	14·54	·8724	7·64
Q. 903	8 0	5·25	21·0	18·68	88·95	14·30	·7507	7·77
D. 1135	6 5	5·10	20·5	18·46	90·04	14·25	·7267	7·79
H. 109	7 4	4·30	20·7	18·32	88·50	14·00	·6020	7·94
H.Q. 458	6 2	5·50	20·0	18·00	90·00	13·90	·7645	8·00
M.Q. 6	4 6	3·50	19·7	16·54	83·96	12·21	·4273	9·10
E.K. 1	8 7	5·50	19·6	15·56	79·38	11·04	·6072	10·06

In each case the fibre has been taken at 12.0 per cent., and the tons cane per ton 94 N.T. is worked on a basis of 90 coefficient of work.

No allowance has been made for the light extraction from hand mill.

Varieties at Kairi.—Some years ago a number of the older kinds of cane were sent up to the Kairi State Farm, near Atherton. These were Rose Bamboo or Rappoe, Striped Singapore or Mauritius Gingham, Meerah, Goru, and Badila. The first three varieties were long the standard canes of the State, but in recent years they developed disease. Badila was also reported to be deteriorating in some districts. It was thought that if they were taken to a higher elevation and colder climate, and allowed to remain there for some years, they might ultimately become rejuvenated, and again become useful canes. These varieties have now been at Kairi for eight years, and, while they have met with drawbacks in the shape of cyclones and drought, they have never shown any traces of disease. They were brought down to the Innisfail Experiment Station in 1919 and planted out, and have also been sent to the Bundaberg and Mackay Sugar Experiment Stations. At the South Johnstone Experiment Station they grew rapidly, and the improvement in their constitution as plants was most marked, when compared with the same variety of cane plants which had been raised on the coast. In a comparison made with Badila plants, those raised on the Tableland germinated first and shot ahead of the local Badila plants. Distributions of these Tableland varieties have been made. Farmers will be supplied with what the Bureau will term "Tableland Badila," as it becomes available for plants. Some of the older varieties, such as Rose Bamboo, Striped Singapore, Meerah, and Goru, have been treated under similar conditions, and may also be obtained. This work is being continued, and D. 1135 has also been sent up to the Tableland. These plants have been in the care of Mr. C. E. Olive, manager of the Kairi State Farm, who has done everything in his power to assist the project. The Bureau is much indebted to him for his care and interest in the work.

11.—LIME, GREEN MANURES, AND FERTILISERS.

Except in one or two districts the price of lime is still prohibitive. More green manure seed has been available latterly, but not nearly enough is being used by our cane farmers. The market is now well stocked with fertilisers and large quantities are being used by cane growers.

12.—ECONOMICS OF THE INDUSTRY.

If the estimated yield of 288,000 tons for the present season is realised the value to Australia will be about £8,750,000.

The yield of sugar in 1921 was the best since 1917, and actually was the second largest crop on record, amounting to 282,198 tons. The sugar areas generally received an adequate rainfall, though in the case of Innisfail and Babinda there was too much rain. The effect of this beneficial season was to greatly increase the crop over that of 1920, and, combined with the increased area put under cultivation, accounted for the fine harvest. The year 1920 was the first under the sugar agreement, and farmers did not benefit to any great extent owing to the drought. But 1921 was a prosperous year to both grower and miller. The effect of the guaranteed price was to induce sugar mill-owners to make considerable additions to their plants and so increase the efficiency of their mills, while farmers in nearly every district put new areas under cane, using in many cases land that had lain unproductive for years. New districts were also opened up, such as Carmilla, near Mackay, and the Maria Creek Soldiers' Settlement, south of Innisfail.

The yield of sugar in 1921 amounted to 282,198 tons, or 114,797 tons more than was manufactured in 1920. The record year of 1917 produced 307,714 tons, but this was largely accounted for by the large area of standover cane left from the 1916 crushing. The present yield was highly satisfactory, and was accounted for by the factors set out in the first paragraph. With the New South Wales production of some 17,000 tons of sugar there was no necessity to import sugar; in fact, the crop was in excess of consumption and necessitated a carry over.

The total acreage under cane in 1921 was estimated by the Government Statistician to be 184,513 acres, the largest acreage ever under sugar cane in Queensland, being an increase of 21,894 acres above that of 1920. Of this area 122,956 acres of cane were crushed, this being also the largest area of cane ever cut, exceeding by 33,814 the acreage crushed in 1920.

This left a balance of 61,557 acres which included cane allowed to standover till 1922, cane cut for plants, and cane planted for 1922. The yield of cane per acre amounted to 18·60, which is the best figure since 1917, and 3·57 tons per acre better than the preceding year. The total tonnage of cane harvested was 2,287,416 tons, an increase of 947,961 tons over 1920. The tonnage of sugar per acre was 2·30, also the best yield since 1917, and exceedingly good.

The tonnage of cane taken to make 1 ton of sugar has improved considerably of recent years. In the year under review it took 8·11 tons of cane as against 8·0 in 1920. The average from 1909 to 1918 was 8·68. It is apparent that during the past few years this figure has gradually been getting less owing to the better varieties of cane now being introduced, and improved methods of cultivation used, as the direct outcome of the work of the Bureau of Sugar Experiment Stations, combined with more efficient work in the mills and the work of the Cane Prices Board.

The return of the molasses manufactured is given as 10,734,399 gallons made up as follows:—

	Gallons.
Molasses returned	10,734,399
Sold to distilleries	2,262,085
Burnt	2,153,200
Used or sold for feed	2,053,338
Sold for other purposes	476,710
In stock	997,274
Manure	78,720
Run to waste	2,712,572
	10,734,399

13.—GENERAL.

Considerable interest attaches to the influx of the Italian to our Northern sugar districts, both in the past and at the present. Inquiries made showed that Babinda has about 12 per cent. of foreign growers, Goondi 7 per cent. Mourilyan has also a fair number, but the figures have not yet been collected. The largest percentage is in the Herbert River, where the following numbers were found in comparison with British farmers and cane-cutters:—

Farmers Supplying Macknade Mill, Ingham.

	Per cent.
Italians	47·4
British	43·5
Others	9·09

Cane Cutters.

	Per cent.
Italians	90·5
British	7·0
Others	2·3

Farmers Supplying Victoria Mill, Ingham.

	Per cent.
British	66
Italians	28·9
Others	5·1
Total	100·

Cane Cutters.

	Per cent.
British	25
Italians	70·1
Russians	2·5
Greeks	2·4
Total	100

"Commercial Cane Sugar."

The expression "commercial cane sugar" is one that has been adopted by the Queensland Cane Prices Board, and is calculated as follows:—

$$\text{Total soluble solids in juice} \times \frac{100 - (3 + \text{Fibre})}{100} = \text{total soluble solids in cane.}$$

$$\text{Sucrose in juice} \times \frac{100 - (5 + \text{Fibre})}{100} = \text{sucrose in cane.}$$

Total soluble solids in cane — sucrose in cane = impurities in cane.

$$\text{Sucrose in cane} - \frac{\text{Impurities in cane}}{2} = \text{commercial cane sugar.}$$

The thanks of the Bureau are due to the various cane farmers' associations, the presidents and secretaries, also to the managers and officers of the various sugar mills, for their courtesy and attention, and for their willingness to assist the work of the Bureau in every way possible.

The metropolitan and country Press are of great service to the Bureau in the dissemination of general information and reports, while the "Australian Sugar Journal" and "The Producers' Review" afford a good deal of space for the work of the Sugar Experiment Stations.

The Bureau is also indebted to the Government Printer for the care taken in printing technical bulletins and reports.

HARRY T. EASTERBY,
Director.

Brisbane, 30th December, 1922.

Price, 1*s*. 6*d*.

By Authority: A. J. Cumming, Government Printer, Brisbane.

14. Economics of the Industry—*continued.*

Maroochy, 9. This shows a very slight decrease from the previous year. The average yield of cane last year was 19·36 tons per acre, the best for some years, the average yield of sugar being 2·56 tons, the second best on record. The highest yield of cane and sugar per acre last year was at Ayr, with 24·64 tons of cane and 3·57 tons of sugar. Those who saw the particularly fine crops in the Lower Burdekin district in 1925 can understand this. The next best yield of sugar per acre was at Ingham and Innisfail, being 2·89 tons. The tonnage of cane required to make 1 ton of 94 net titre sugar was 7·55 tons, also the second best result. The lowest tonnage taken to make a ton of sugar is given as 6·89 in the Ayr, Bundaberg, and Gin Gin districts, the highest being 9·94 in the Childers, Maryborough, and Mount Bauple areas, according to the report of the Registrar-General. The yield of sugar in New South Wales for last year was about 32,000 tons, and from beet in Victoria 2,315 tons.

There were thirty-seven raw sugar mills and two refineries in Queensland in 1925, employing 6,581 hands.

The return of molasses manufactured in 1925 was 18,164,416 gallons. How this was used is set out below:—

	Gallons.
Sold to distilleries	3,430,303
Burnt	3,681,394
Used or sold for feed ..	2,176,649
Sold other purposes	319,485
In stock	1,590,212
Manure	1,287,400
Run to waste	6,278,973
Total	18,164,416

Consumption.

The Commonwealth Statistician remarks in the 1925 Year Book that the consumption of sugar in 1923-1924 was estimated to average 117 lb. per head. This would probably mean of refined sugar.

The following tables are of sufficient interest to be reprinted. The first table should prove useful to those who would deny the sugar industry a fair deal:—

THE COST OF LIVING.

SUGAR INCREASES COMPARED.

Article.	1914.	November, 1924.	Increased Percentage of 1924 over 1914.
Sugar, per lb. ..	3d.	4·5d.	50
Butter, per lb. ..	14½d.	18·15d.	12·5
Meat, per lb. ..	5½d.	8·45d.	53·6
*Bread, 2-lb. loaf ..	3·13d.	5·15d.	54·6
Jam, per lb. ..	4d.	7·73d.	93·2
Milk, per quart ..	4·9d.	7·15d.	45·9
Coal per ton (wholesale at wharf) ..	23/9d	40/–	68·4
Cost of living index ..	1105	1670	51·1
Basic wage, per week	£2 13 0	£4 3 0	56·6

*In February, 1925, bread was 5·75d. per loaf, or 72·7 per cent. above the 1914 price.

Melbourne, August, 1925.

In the table given hereunder are the prices of sugar per ton of raw, refined, and retail, from 1915 to 1925:—

PRICES FLUCTUATION.

Dates.	RAW SUGAR. Price to Grower and Miller per Ton.	REFINED SUGAR. Wholesale Price per Ton.	Retail Price per Lb.
	£ s. d.	£ s. d.	d.
19–7–15 to 15–1–16	18 0 0	25 10 0	3d.
16–1–16 to 30–6–17	18 0 0	29 5 0	3½d.
1–7–17 to 24–3–20	21 0 0	29 5 0	3½d.
25–3–20 to 30–6–20	21 0 0	49 0 0	6d.
1–7–20 to 31–10–22	30 6 8	49 0 0	6d.
1–11–22 to 30–6–23	30 6 8	42 0 0	5d.
1–7–23 to 21–10–23	27 0 0	42 0 0	5d.
22–10–23 to 31–8–25	26 0 0	37 11 4	4½d.
*–9–25 to 31–8–28	26 10 0	37 6 8 (Refined) 33 3 9 (Mill White)	4½d. 4d.

*The price of raw sugar for the years 1925-28 is estimated at £26 10s., but in the event of export losses occurring, as in 1925 and 1926, the price actually received by the growers and millers combined will be much less.

The table given below sets out the mill's estimates in October, 1925, of the cane expected to be crushed and the amount returned to the Sugar Experiment Stations at the end of the crushing as having been actually dealt with:—

Mills.	Tonnages of Cane Estimated to be Crushed in October, 1925.	Tonnages actually Crushed at End of Season.
Mossman	85,000	80,276
Hambledon	182,000	187,799
Babinda	178,000	164,238
Mulgrave	180,000	179,754
Goondi	170,000	168,249
South Johnstone and Tully ..	233,000	229,818
Mourilyan	160,000	153,028
Victoria	241,000	214,807
Macknade	217,000	229,982
Pioneer	150,000	145,754
Kalamia	139,000	123,120
Inkerman	150,000	170,320
Invicta	80,000	78,333
Proserpine	110,000	103,269
Cattle Creek	58,000	61,754
Racecourse	88,000	89,588
Plane Creek	136,000	128,521
Farleigh	140,000	148,544
Pleystowe	119,800	114,235
Marian	85,000	83,284
North Eton	57,000	61,818
Qunaba	60,000	63,326
Millaquin	112,000	108,990
Fairymead	117,000	125,113
Bingera	102,000	105,782
Gin Gin	45,000	43,812
Childers	70,886	70,887
Isis Central	82,000	76,894
Maryborough	37,000	31,715
Mount Bauple	55,000	46,774
Moreton	90,000	83,280
Stegelitz	3,000	3,002
Eagleby	2,400	2,156
Carbrook	630	595
Alberton	2,240	2,232
Rocky Point	15,000	14,775
	3,752,956	*3,695,824

* This total is somewhat more than given by the Government Statistician, but this may be due to the fact that some mills continued their crushings into 1926.

15. GENERAL.

The Falkiner Cane Harvester, referred to in last year's report, has been further tried out in North Queensland this season, and although the machine gave promise it requires more power and further alterations and adjustments to enable same to operate successfully in heavy crops of green cane. These, it is hoped, will be carried out during the next few months, when it is anticipated better results will be achieved. The throwing out of the cane in regular heaps and the picking up and loading will have to be considered.

This year the Steiglitz mill at Pimpama Island closed down, the cane being sent to Rocky Point factory.

Canada has afforded a more favourable tariff on imported sugar, which makes an increase in the preference to Australian raw sugar imported into Canada for refining, the preferential advantage now being stated to be £5 3s. 2d. per ton. A considerable amount of Queensland's raw sugar has been exported to Canada this year.

Commercial Cane Sugar in Cane.

The expression "commercial cane sugar" is one that has been adopted by the Queensland Cane Prices Board, and is calculated as follows:—

$$\text{Total soluble solids in juice} \times \frac{100 - (3 + \text{Fibre})}{100} = \text{total soluble solids in cane.}$$

$$\text{Sucrose in juice} \times \frac{100 - (5 + \text{Fibre})}{100} = \text{sucrose in cane.}$$

Total soluble solids in cane — sucrose in cane = impurities in cane.

$$\text{Sucrose in cane} - \frac{\text{Impurities in cane}}{2} = \text{commercial cane sugar.}$$

Publications.

During the year the following were issued, viz.:—

Bulletin No. 19 (Division of Entomology)—"Notes on Queensland Cane Insects and Their Control."

Bulletin No. 2 (General Series)—"Varieties of Sugar-cane in Queensland" (second edition revised).

Several leaflets on cane diseases.

Acknowledgements.

In concluding this report the Director wishes to thank the various Local Producers' Associations, District Councils, and Cane Growers' Associations, their presidents and secretaries, also the managers and officers of the different sugar mills, for their help in Bureau work.

The thanks of the Bureau are also due to the Registrar-General and his staff for information supplied from time to time.

In the dissemination of general information relating to the sugar industry, the Director is indebted to the metropolitan and country Press, while the "Australian Sugar Journal," "Queensland Producer," "Producers' Review," and "Agricultural Journal" devote a large amount of space to the work of the Sugar Experiment Stations as well as specially illustrating many articles. Thanks are also due to the Government Printer for the care taken in printing technical reports and bulletins.

The Director also desires to acknowledge the assistance rendered by Miss Wyllie, the typiste to the Bureau, both in general work and the preparation of this report for the Printer.

H. T. EASTERBY, Director.

Brisbane, 1st December, 1926.

Price, 2*s*.

By Authority: Anthony James Cumming, Government Printer, Brisbane.

indigenous hymenopterous parasite (*Apanteles nonagriæ*) has been successfully carried out, for the first time in Queensland; successive broods of this tiny braconid wasp having been reared in special cages at our laboratory, and its life-history carefully studied.

Control of our weevil-borer of cane has been attempted by the breeding and subsequent liberation in affected areas of its dipterous parasite, one of the tachinid flies (*Ceromasia sphenophori*, Vil.).

Fumigating Eggs of "Grey-Back" Beetle.

Laboratory experiments were conducted at different times during November with cages of soil containing eggs of this cane-beetle, which were treated with ½-oz. injections of bisulphide administered at distances of from 4½ to 8 inches.

Little change in external appearance was noticed until the third day, when the control eggs were seen to have grown larger, while treated specimens had not developed, but lost their creamy colour, having become dark-brown and partially covered by a whitish mould.

Although no field experiments were carried out, we may safely conclude from the above details that such fumigation kills these eggs in a few hours, but naturally fungi do not develop on the chorion until the internal albuminous matter commences to decompose.

Bisulphide for Cane-Grubs.

Fumigation of the grubs of albohirtum with carbon bisulphide proved beneficial in those cases where the work was performed at the right time, viz., when larvæ were in the second stage or had just moulted into the third, and the soil was not too wet. In the friable volcanic soils at Greenhills—the mechanical composition of which appears to be ideal for such treatment—some experiments conducted by the Colonial Sugar Refining Company yielded interesting data.

Cane that was fumigated after it had shown signs of the presence of grubs, but unfortunately was not able to make fresh roots to take the place of those devoured, owing to a continuance of dry conditions, ultimately fell over, together with the control plots, during windy weather.

A block of Badila treated earlier in the season, however, remained standing, outstripping in growth the control area alongside.

A photograph of this latter experiment, taken 13th July, appeared in the "Australian Sugar Journal" (August, vol. XIV., p. 287).

Interest was manifested by a few of our growers in a bisulphide machine designed by Mr. Dawson, of Gordonvale, worked by one man and a horse, and intended for treatment of young ratoon and plant cane.

A continuous stream of bisulphide was delivered under considerable pressure at a few inches below ground level by means of thin copper tubes attached to iron cultivating teeth, and communicating with a tank carried on the machine. These two teeth were adapted to work at from about 2 to 6 inches from the lines of stools.

Unfortunately, the field tests proved unsatisfactory, giving, in fact, entirely negative results, owing to no provision having been made for filling in the furrow left by these teeth, or for consolidating the earth above the lines of injection. The bisulphide being left in loosened-up earth quite dry at the surface, doubtless escaped upwards during the ordinary course of evaporation of the moisture.

It should, however, be a simple matter to overcome the abovementioned defects in design.

Some field experiments made at Meringa at a time when third-stage grubs of *frenchi* were seriously damaging young plant cane gave excellent results. When fumigating larvæ of *frenchi* in the spring, the work should be so timed as to deal also with late eggs and first-stage grubs of the grey-back, so that the ground may be cleared of both these cane-beetles during the one operation.

Dry Fumigants.

Many substances have been investigated here during the past six months, including various forms of napthalene, pungent oils, and certain deadly poisons, the latter of which were in some cases combined with cheap chemical compounds in order that they might be handled safely during field operations. Several of these preparations yielded excellent results against caged grubs in our insectary, but when tested in the open did not altogether realise expectations.

The most promising of these fumigants was paradichlorobenzine, the possibilities of which, as a grub destroyer, were first investigated by the writer seven years ago (see "Queensland Agricultural Journal," June, 1915, p. 262). A special report has been issued ("Australian Sugar Journal," vol. XIV., September, 1922, p. 341), which deals fully with the various experiments carried out in this connection. It is hoped that field tests to be conducted this season may prove successful.

The points requiring chief study in the field will relate mostly to the effect on rate of evaporation and penetration of the fumigant of clay lands, closely-packed volcanic soils, heavy rains, temperature, &c., and the effect of the fumigant on young growing roots of cane.

Soil Repellants.

A few experiment plots at Meringa were treated between the dates 12th November and 8th December with various insecticidal substances, which were sprinkled on the surface of the ground against cane stools on each side and between same over a strip about 3 feet wide, with a view to inducing egg-laden females of *albohirtum* to oviposit elsewhere.

The substances tested were tar, napthalene, chloride of lime, tobacco dust, and carbolineum emulsion, each plot consisting of one-eighth of an acre and being separated by a control plot.

The ground was treated about a week after the first emergence of cane-beetles, before they had commenced to lay any eggs.

The coal-tar retained its odour longest, being quite pronounced and presumably repellant about a fortnight after application, while the smell from chloride of lime could be noticed after a lapse of nine days, napthalene twelve days, and the other chemicals a week or less.

When the cane was cut in August little difference was noticed between the treated and check plots. The sticks on that which had had napthalene appeared to be straighter and about 6 inches longer than those from the control alongside. Where the soil had been sprayed with carbolineum and soap emulsion the cane was noticeably higher than on any other plot, about 50 per cent. of the sticks having remained standing. On the whole, the results cannot be regarded as conclusive proof of a positive nature.

Entomogenous Fungi and Bacterial Diseases.

The green Muscardine Fungus (*Metarrhizium anisopliæ*) occurred as usual in our canefields during autumn months, and doubtless destroyed a certain proportion of cane-grubs.

Three diseases of a bacterial nature were met with during June affecting larvæ of *albohirtum* and *frenchi* collected behind the plough in canefields around Meringa. One of these bacteria—presumed to be the species *Coccobacillus nigrofasciens*, Northr.—occurred rather freely, and presents possibilities of future usefulness as a controlling factor. Cultures were made on slices of potato as a medium, and healthy grubs inoculated by us with this bacterium succumbed within from three to five days. The somewhat slender rod-shaped organisms causing this disease were found to occur almost invariably in pairs.

Initial experimentation with our bacteria affecting cane-grubs yielded some interesting data, and will, it is hoped, be continued next season.

Poison Baits.

This line of control has received a little attention, a number of poisonous preparations having been fed to cane-grubs confined in cages at our laboratory during the period occupied by the second and third larval instars of this pest. The best results were obtained with aceto-arsenate of copper, which is easily the most deadly of the cheaper forms of arsenic, thus confirming the results of previous experimentation in this connection carried out by the writer in 1915 (see "Bulletin No. 4" of this office).

Trap-Trees and Trap-Crops.

Growers wishing to collect cane-beetles from feeding-trees adjoining their headlands were advised to plant young trees of *Ficus pilosa* and *nesophila*, the leaves of which are greedily devoured by grey-back beetles. Such trees should be pruned occasionally to keep the heads low and spreading, and could either be collected from during the flighting season or sprayed with some suitable arsenical directly the beetles emerge from the soil. Both these figs can be easily grown from cuttings. Existing native feeding-trees near headlands that happen to be suitable for collecting purposes should be looked after and given a chance to develop, while vegetation unlikely to serve any useful purpose could be cut out. Such action would tend to force the beetles to concentrate in definite centres and thus facilitate collecting operations.

Several suckers and seeds of a persimmon tree, the foliage of which was reported to have poisoned cane-beetles in Mackay during 1896, were very kindly forwarded to this experiment station last May by Mr. James Croker, in order that the toxic properties of the leaves might be tested in connection with our grey-back beetle.

Experiments were made with grubs of this beetle, but we found, as expected, that they were able to eat the leaves of this persimmon without being in the least affected.

The foliage of various poisonous plants has, from time to time, been fed to cane-grubs confined in cages of soil at our laboratory, with results of a more or less encouraging nature. I am of opinion that this possible form of control warrants more extended investigation.

Attractive Aromas for Controlling the Cane-Beetle.

With regard to the question of combating our grey-back beetle by the aid of aromas, we have good reasons for assuming that the movements of this insect are very sensibly affected by forces of a chemotropic nature, which probably exercise important influences on the flight of the females during the period preceding oviposition.

Initial experimentation was carried out by the writer in December, 1915, when it was discovered that grey-back beetles reacted negatively towards such odours as cajeput oil, acetic and carbolic acids, nitrobenzine, oil of almonds, &c., but were not in the least influenced by odours arising from oil of cloves, fish oils, or even the fumes of 40 per cent. formalin.

The olfactory sensibilities of this species, however, were amply demonstrated, and I felt justified in believing that reaction of a positive nature was certainly attainable.

With view to securing further data in this connection these experiments were continued last December (1921), the odours used being placed in small tins, and resembling those arising from the stems and foliage of chief food-plants of the beetle, together with miscellaneous smells such as emanate from decaying vegetation, &c.

There can be little doubt that the highly sensitive antennæ of this insect help it to locate the position of favourite feeding-trees, since isolated specimens of such figs as *Ficus pilosa, nesophila*, &c., are usually loaded with beetles each season, although often growing alongside or close to food-plants that happen to be less palatable.

We are making preparations for experimenting this coming season with a variety of aromas comprising various essential oils and aromatic essences (see "Science Notes," "Queensland Agricultural Journal," vol. XVIII., October, 1922, p. 307.

I have already pointed out the importance of this ideal control method, which may enable us to capture the female beetles before they have laid their eggs.

Poisoning the Beetles.

Five sets of experiments have been conducted this season, comprising eighty-nine cages containing leaves sprayed with arsenical solutions.

Details of this work were published in my monthly report for December, 1921 ("Queensland Agricultural Journal, vol. XVII., p. 81).

The first beetles to die were those that had eaten portions of the poisoned leaves. Paris green 1 lb., lime 1½ lb., in 8 gallons of water, proved fatal from four to seven days after feeding, while arsenate of lead took nine days. About 50 per cent. of these beetles died just a fortnight after capture. The beetles that lived longest (from sixteen to twenty-four days) were those that took no food whatever.

Confined specimens of *albohirtum* fed indifferently either on leaves of *Eucalyptus tessalaris* or of the "tar tree" (*Semecarpus australiensis*).

Control of the Large Moth-Borer.

Cane on the Lower Burdekin was severely damaged last spring by caterpillars of our large moth-borer (*Phragmatiphila truncata*, Walk.), several complaints from growers seeking advice having been received by us.

In order to cope with this pest, search was made for a certain braconid wasp-parasite, which had been bred by the writer for the first time in Queensland during 1919 from caterpillars of this moth found destroying young ratoon cane at Pyramid, near Gordonvale.

Success attended our efforts, and a number of these parasites being again bred on 5th December, 1921, were at once placed in suitable cages containing caterpillars of the moth-borer, and from these were obtained twenty days later (25th December) three broods consisting of about 230 wasps.

The parasite in question, *Apanteles nonagriæ*, Oliff, is a minute black wasp no bigger than a sand-fly, and having thread-like antennæ, which in the male are much longer than the body, but a little shorter in the opposite sex. The female punctures the caterpillar by means of a special piercing instrument or ovipositer, depositing eggs inside it, which in due course produce maggots that start at once to feed on the internal tissues. This larval stage occupies about fourteen days, the maggots then leaving the body of the host and spinning a mass of white egg-like silken cocoons, which are usually concealed behind some dead leaf-sheath, but sometimes located inside the tunnel of the bored ratoon. In view of the fact that each of these parasites is able to lay nearly a hundred eggs (our highest record here being ninety-three), and, moreover, has a life-cycle of only three weeks or even less, it is not surprising that moth-borer attack should be confined in the Cairns district to a few localities, where it is seldom noticed except early in the season, and never assumes serious proportions.

In view of the extensive ravages caused by this pest at Ayr and Rita Island, it seems possible that its *braconid* parasite may not occur throughout the Burdekin. In a letter addressed to the secretary of the United Cane Growers' Association at Ayr, we offered to forward them consignments of the parasite in question for liberation in cane fields harbouring the moth-borer, but not receiving any reply from the association the matter was dropped.

The Weevil-Borer of Sugar Cane.

This pest, which may be considered as being second only in economic importance to our notorious grey-back cane-beetle, continues to give trouble in many localities. Its prevalence in the Herbert River district during the past season induced the Colonial Sugar Refining Company to establish a breeding-cage at Macknade for the rearing and subsequent liberation of the tachinid fly parasite (*Ceromasia sphenophori*, Vil.) (see monthly report for August, 1922, "Queensland Agricultural Journal," October, vol. XVIII., p. 278).

Our work of breeding this useful parasite at Meringa laboratory has been continued, and it is satisfactory to be able to report that we have now succeeded in establishing it in the Gordonvale area.

Specimens liberated at Riverstone last December produced the first brood of flies five weeks later. Owing to the interest taken in this work by Mr. G. Alley the cane was left uncut, so that several successive broods emerged from it in due course, and it is to be hoped will ultimately spread throughout that district. Flies were released also in three other centres near Gordonvale, and in the Aloomba area.

During August, Mr. Cottrell Dormer, assistant entomologist, visited South Johnstone and liberated sixty tachinid parasites.

Arrangements have been made to carry on this work at Macknade and Ingham, in collaboration with the manager of Macknade Mill, and in order to obtain a stock of flies with the least possible delay, we have erected another large breeding-cage at Meringa.

Unfortunately, a spell of wet weather, lasting about a fortnight, set in during December, establishing climatic conditions eminently favourable to the development of an entomogenous fungus (*Empusa* sp.), which straightaway attacked and destroyed fully 200 tachinids that had just emerged in one of our large cages, and were intended for distribution at South Johnstone and Goondi.

This fungus probably operates as a controlling factor in canefields during the wet season, affecting, perhaps, broods of flies emerging between December and February.

Prevalence of Cane-Beetles.

Grey-back beetles appeared this season (1921-22) in considerable numbers, and had dry conditions set in during April and May, serious damage to cane would probably have resulted.

Collecting has been discontinued in the Hambledon and Mulgrave Mill areas since 1917. Growers at Macknade and Ripple Creek are not slow to recognise the value of this controlling factor, since in the latter locality last year only two farmers objected to contribute to the pest destruction fund, while at Macknade every grower subscribed to it. At Highfield, near Gordonvale, a big emergence of beetles occurred early in November, the insects being very numerous on various small food-plants bordering the main road, and congregating in thousands on some large trees of *Ficus benjamini*, close to the residence of Mr. J. Cannon.

Introduction of Parasites.

This matter was touched on in my last annual report, where it was mentioned that upon taking charge of Meringa Experiment Station in May, 1921, one of the first steps entered upon was to get into touch, if possible, with entomologists in other parts of the world, with a view to procuring *scoliid* wasp-parasites for introduction into our canefields.

About nine months later, replies to my specially prepared list of questions came to hand from Dr. Guy, A. K. Marshall, and Professor S. Leefmans. The latter scientist enumerated nine species of *scoliidæ* known to be parasitic on *scarabæidæ* in Java, three of which appear likely to meet our requirements—one of them, in fact (*Dielis thoracica*, Fabr.) being the same size as our own principal digger-wasp, and parasitic on grubs of *Lepidiota stigma*, F., a cockchafer belonging to the same genus as some of our own cane-beetles (see monthly report for April, 1922, "Queensland Agricultural Journal," June, vol. XVII., p. 299).

Further correspondence on this interesting question resulted in our getting a letter from Professor Leefmans expressing his willingness to breed and forward to Meringa cocoons of *scoliid* parasites that attack cane-grubs in Java. In return for this we have agreed to send him cocoons of our *Campsomeris* digger-wasps, which it is hoped may afford material help in controlling grubs affecting cane in Java.

It is proposed to commence breeding here during December, and forwarding consignments of cocoons in January and February.

New Digger-Wasp Parasite.

Scolia formosa, Guer., was recorded for the first time as being parasitic on grubs of *Lepidoderma albohirtum*, Waterh. in Queensland.

The discovery was made by the writer in 1920, when chancing to catch a female of this handsome species at Gordonvale its life cycle was successfully worked out. The specimen lived just eight weeks in confinement, laying during that time twenty-four eggs on third stage grubs. Only eleven cocoons were obtained, the remainder of the eggs having been destroyed by mites and other enemies. The life-cycle occupied 108 days, three being taken up by the egg stage, eleven by the maggot condition, and ninety-four by the cocoon stage.

Visits to other Sugar Districts.

Owing to pressure of other work, it was not possible to visit or report on the insects affecting cane in all our sugar-growing districts. Various portions of the Cairns and Babinda areas, however, were visited from time to

time, and extended investigations carried out in the South Johnstone and Herbert River districts (see "Queensland Agricultural Journal," vol. XVIII., pp. 146-148 and 277-279).

Work of Assistants.

During August, 1921, Mr. J. E. Murcott was temporarily engaged in the capacity of assistant, but resigned duties five months later to go to Western Australia.

At the end of the same year Mr. W. Cottrell Dormer was appointed by the State Government to the position of assistant to entomologist at Meringa experimental laboratory, and took up his duties on 21st December. The work assigned to him has been of a technical and scientific nature, such as care of the office collections of insects, recording meteorological observations, examination of diseases of cane-grubs, carrying out experimental work, and other miscellaneous duties. In all matters entrusted to him he has displayed unremitting zeal, coupled with a determination to attain proficiency in such branches as exercise an important bearing on the cane-grub problem.

Mr. Dormer has shown an ability and aptitude above the average for observing the habits of insects and their probable economic significance.

In view of the increased activities of this experiment station—resulting from our agreement to make more extensive liberations of tachinid fly-parasites of the cane-borer and to forward digger-wasp parasites of our cane-grubs from Queensland in exchange for species of *Scoliidæ* from Java—it is very desirable that a second assistant should be engaged with as little delay as possible. The duties of such an assistant would be mainly of a clerical and technical nature, including also routine office work.

Museum and Collections.

A small museum, consisting almost exclusively of objects or diagrams illustrating the life-cycle, anatomy, or economy of insects affecting sugar-cane, was started this year in our laboratory. Coloured charts showing the underground working and metamorphosis of our principal cockchafer beetle, and the effect produced by same upon the growing crop during each month of the year, were executed by the writer with a view to their use in the lecture hall later on. These and several other coloured diagrams are on view in the museum for the benefit of growers who may be interested in such educational work.

Other exhibits comprise showcases illustrating the life history and parasitic enemies of the grey-back beetle and weevil-borer of cane; a small general collection of insects of most orders, including the eggs, grubs, and pupæ of various scarabæidæ attacking cane roots; fungus and bacterial diseases of grubs, &c., &c.

A small exhibit, representative of the work of this experiment station, was loaned to the Australian Sugar Producers' Association for inclusion in a comprehensive display embracing every activity of the Queensland sugar industry, made by this association at the last agricultural show in Brisbane.

Our exhibit comprised three showcases of cane-beetles, their parasitic and predaceous enemies, &c., together with photos illustrating the nature of damage to cane from grub attack, and views of the laboratory and residences at Meringa experiment station.

Cairns Show Exhibit.

This laboratory was again represented at the annual meeting of the Cairns Agricultural, Pastoral, and Mining Association held at Woree.

The entomological display was well patronised, and many growers availed themselves of our invitation to freely discuss the question of grub and beetle control, with the result that much interesting exchange of opinion took place regarding several complex phases of the cane-grub problem.

PUBLICATIONS.

Monthly Progress Reports.

These appeared in the "Queensland Agricultural Journal" and other publications. The following references to their occurrence in our "Agricultural Journal" will be found useful to entomologists interested in the sugar industry:—Vol. XVI., p. 274; vol. XVI., p. 321; vol. XVI., p. 387; vol. XVII., p. 36; vol. XVII., p. 80; vol. XVII., p. 103; vol. XVII., pp. 216 and 236; vol. XVII., p. 299; vol. XVIII., p. 32; vol. XVIII., p. 87; vol. XVIII., p. 146.

Science Notes.

Early stages of *Macrosiagon* (*Emenadia*) *cucullata*, Macl. Factors Favourable to the Increase of Digger-Wasp Parasites. Factors Affecting the Egg Stage of our Digger-Wasp Parasites, with one plate ("Queensland Agricultural Journal," vol. XVIII., pp. 39-45). *Note.*—Plate of Triungulin of *Macrosiagon cucullata* in vol. XVII., p. 308. Factors Limiting the Increase of Scoliid Parasites, op. cit., vol. XVIII., p. 231. The influence of Chemotropism on *Lepidoderma albohirtum*. Water op. cit., vol. XVIII., October, 1922, pp. 307-310. A New Moth-Pest of Sugar-cane and Maize ("Queensland Agricultural Journal," vol. XVI., p. 76).

I have the honour to be, &c.,

EDMUND JARVIS,

Entomologist in Charge.

The following illustrated Bulletins were issued during the year:—

Bulletin 13.—Natural Enemies of Sugar Cane Beetles in Queensland, by Dr. J. F. Illingworth.

Bulletin 16.—Australian Sugar Cane Beetles and their Allies, by J. F. Illingworth and Alan P. Dodd.